

★ THE WARMING OF LONG ISLAND

How shorter winters, hotter summers and rising waters could transform the Island — and what scientists say can be done

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Scientists say the Long Island of the future will have shorter, wetter winters and oppressively hot summers, with seas rising and storm surges so strong they will threaten beaches, salt water marshes and infrastructure.

The warnings are familiar, but after superstorm Sandy, policymakers are listening — and the experts' predictions are helping define what needs to be done.

"Sandy is the tipping point of response to climate change in our region," said Cynthia Rosenzweig, senior research scientist with the NASA Goddard Institute for Space Studies at Columbia University. "It's like we were in low gear and now we've moved to high gear."

Political leaders speak about the issue with a new urgency.

Gov. Andrew M. Cuomo has named three commissions to "rethink and redesign" infrastructure. President Barack Obama, in his State of the Union address, said the nation should heed "the overwhelming judgment of science and act before it's too late."

Children born this century will see and feel a significant shift in the region in their lifetime, according to a 26-member panel in their October 2011 ClimAid Report.

The document — commissioned by the New York State Energy Research and Development Authority — was crafted by scientists and researchers from the NASA Goddard Institute, Columbia University, the Institute for Sustainable Cities at the City University of New York, the Northeast Regional Climate Center at Cornell University, the New York State Water Resources Institute, MIT, New York University and Rutgers, among others. They used 16 global climate models for their temperature and precipitation projections and seven for sea level rise.

Among their findings:

SEA LEVELS A threat to the coastline

New York could see a 1- to 5-inch sea level rise by the 2020s, 5 to 12 inches by the 2050s and 8 to 23 inches by the 2080s, compared with a 2000-04 base period, depending on how much greenhouse gas emissions are limited in the meantime.

That rise would leave low-lying places such as parts of Freeport and Mastic underwater near the end of the century, according to Jay Tanski, a Stony Brook University scientist. Even a moderate nor'easter would bring significant surges because the ocean would already be swollen, ClimAid scientists said.

The rate of sea level rise could be greater — up to 10 inches by the 2020s, 29 inches by the 2050s and 55 inches by the 2080s — if there is significant melting of the polar ice sheets — a phenomenon, the scientist said.

Some researchers say that polar phenomenon is under way.

"It could be a whole new geography," said Vivien Gornitz, a sea-level expert at Columbia who helped craft the report.

The East Coast of the United States will experience some of the greatest sea level rises in the world because its land is

sinking by about a millimeter per year — about 3 inches by 2080 — from both human and natural geologic causes.

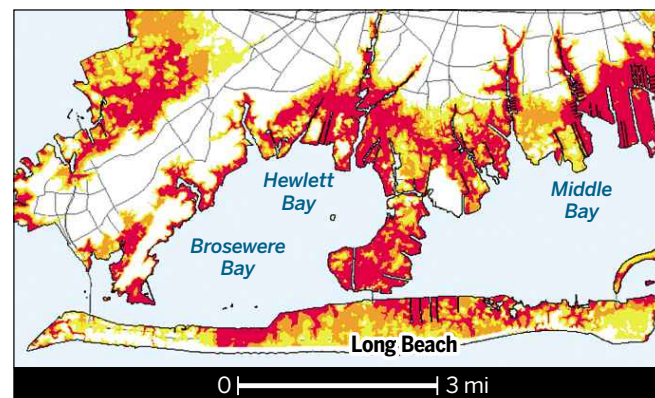
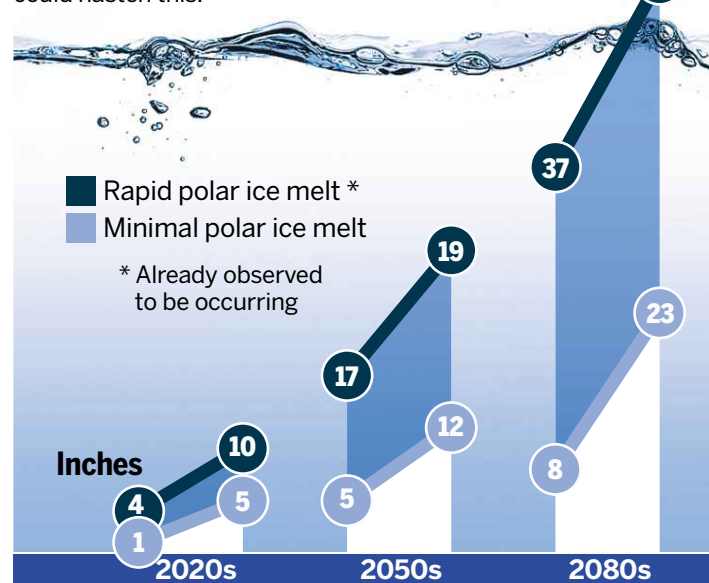
Rising tides will mean more coastal erosion and further endanger our wetlands, which help buffer the region from severe storms and filter out certain pollutants as water moves from the land to the sea.

"If high tides become higher, they cause some of the wetlands to become open bodies of water," said Paul Kirshen, research professor at the Institute for the Study of Earth, Oceans and Space at the University of New Hampshire. More saltwater intrusion would bring a higher threat of flooding and contamination, he said.

Average annual precipitation is projected to increase up to 5 percent by the 2020s, up to 10 percent by the 2050s and up to 15 percent by the 2080s, the ClimAid scientists found.

The National Academy of Sciences in 2010 found that of 1,372 climate researchers surveyed, 97 percent to 98 percent believe human activity through the release of greenhouse gases is the biggest contributor to global warming.

Experts say sea levels will increase steadily throughout the century and beyond. Melting of the polar ice sheets could hasten this.



Vulnerable coastline 1-in-10-year flood zone

Projected flood map for a 1-in-10-year storm for Long Beach and surrounding communities in ClimAid's rapid ice melt scenario.

2020s
2050s
2080s



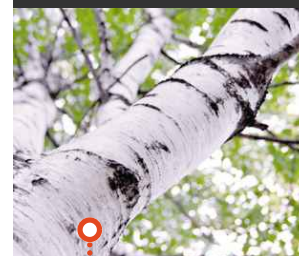
Rising tides will mean more coastal erosion like this at a Montauk home, caused by superstorm Sandy.

PHOTO BY GORDON M. GRANT

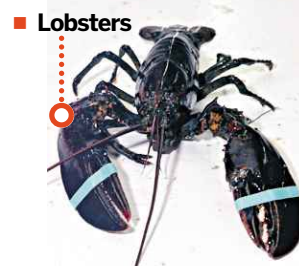
LI SPECIES WOULD ALSO BE AFFECTED

Rising temperatures and other environmental factors have begun driving hallmark plants and creatures from Long Island and its waters. In the decades to come, newcomers from more southern climes will take their place:

OUT

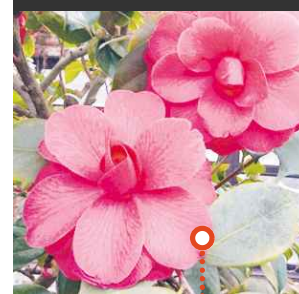


- White bark birch, red oak, Canadian hemlock



- Lobsters

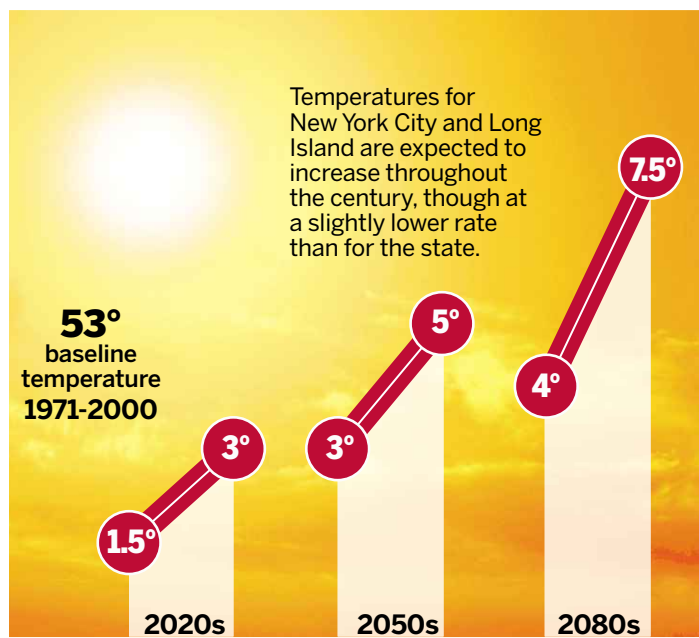
IN



- Crape myrtle, **camellia**
- Sweeter wines
- Longer farm growing seasons, subtropical produce (squash, sweet potatoes, okra)
- Crabs, brown pelicans, **blue grosbeaks**



TEMPERATURES On the rise



Temperatures across the state are expected to rise 1.5 to 3 degrees Fahrenheit by the 2020s, 3 to 5.5 degrees by the 2050s and 4 to 9 degrees by the 2080s, compared with a 1970-1999 base period, ClimAid found.

Those increases will be tempered for New York City and the Island, but not by much. A 3- to 5-degree rise is predicted by the 2050s and 4 to 7.5 degrees by the 2080s.

The mean temperature in Upton, monitored by Brookhaven National Laboratory, was 54.22 degrees Fahrenheit last year, the warmest in 63 years of data collection.

The United States experi-

enced its hottest year on record in 2012 and was plagued by severe weather and drought.

Higher temperatures will bring a spike in pollen, ragweed, poison ivy and Lyme disease, plus more and hotter heat waves, which will increase heat and respiratory-related illnesses, scientists say.

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FUTURE Slow the damage

Some of the change tied to carbon emissions is irreversible for the foreseeable future.

“We are already locked into some additional warming and sea-level rise because of the greenhouse gas we’ve already emitted,” said Radley Horton, associate research scientist at Columbia’s Earth Institute.

The seas will rise for centuries regardless of our future efforts to curb emissions. That’s because of the lag time it takes for such a large body of water to reflect a change.

Without human influence, New York Harbor would have peaked at 8 feet above mean high water (the average high-tide line) during Sandy, rather than the 9.15-foot total, said Scott Mandia, a hurricane expert and physical sciences professor at Suffolk County Community College.

The difference meant tens of thousands more people and homes were flooded in New York City, said Mandia. Curbing greenhouse emissions, while no immediate cure, would still help said, he said.

“We are headed toward a climate cliff,” he said. “But we can take our foot off the gas.”

The keys to survival are mitigation and adaptation,

which can happen at the household, regional, state, national and global level.

Some Islanders have begun to elevate their homes. And public officials are considering how better to protect critical infrastructure.

Of the \$60.2 billion in federal Sandy aid, \$13 billion will be for mitigation, including \$3.5 billion in coastal and waterway work by the Army Corps of Engineers, \$5.5 billion for railroads, subways and other transportation and \$2 billion for community and housing projects.

Kirshen said that as sea levels rise, coastal residents have these choices regarding “built environment”:

- Accommodate climate change by raising office buildings, floodproofing homes and elevating roads, for example, or protect what they have by building floodgates.
- Retreat from the shore, restricting where people can live.
- Do nothing and keep rebuilding.

But inaction could be costly. Experts say every dollar spent on mitigation will save \$4 in recovery. Yet to build without a long-term vision is to unwittingly narrow options, Kirshen said.

“We have got to plan for this,” he said.