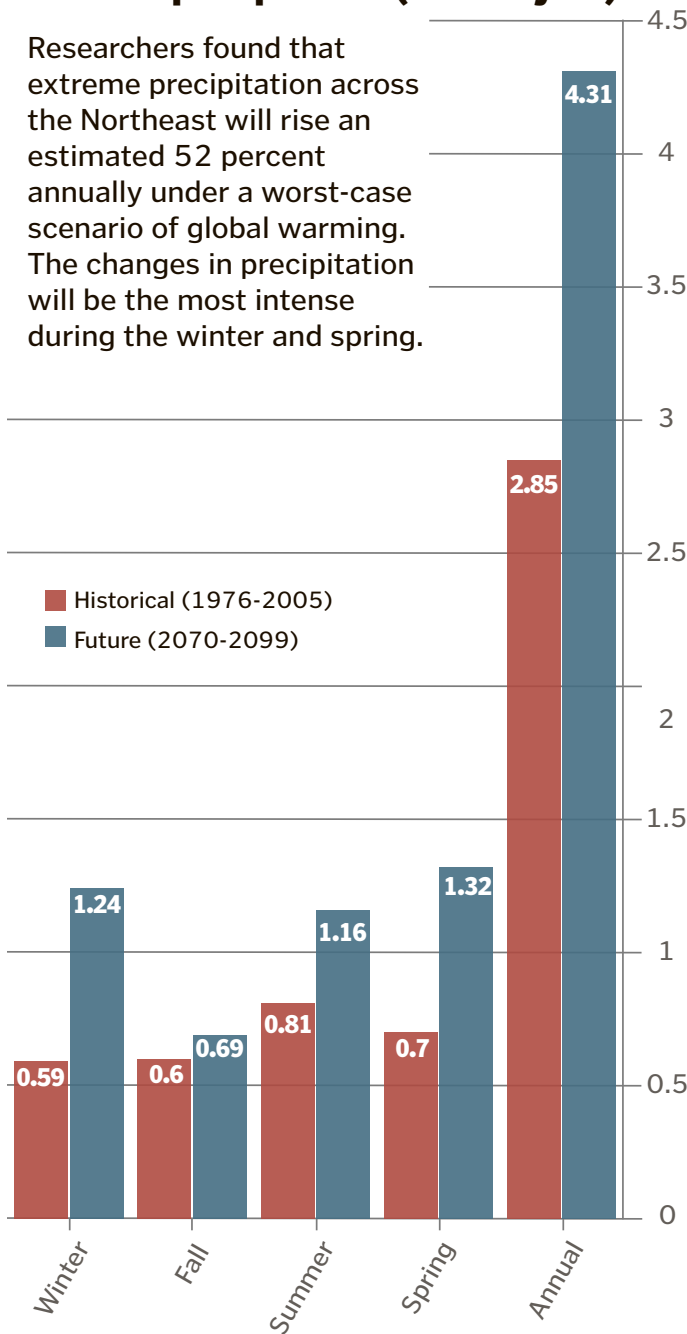


Precipitation study raises flag

Extreme precipitation (inches/year)

Researchers found that extreme precipitation across the Northeast will rise an estimated 52 percent annually under a worst-case scenario of global warming. The changes in precipitation will be the most intense during the winter and spring.



SOURCE: Picard, C.J., Winter, J.M., Cockburn, C. et al. Twenty-first century increases in total and extreme precipitation across the Northeastern USA. Climatic Change

DAIGO FUJIWARA/GLOBE STAFF

Says we will see more storms with extreme snow and rain if no action is taken on climate

By Sabrina Shankman

GLOBE STAFF

Maybe you remember January and February 2015, when a string of blizzards dumped 65 inches of snow on Boston, collapsing roofs and paralyzing the city with glacial heaps that didn't melt till June. Or January 2022, when more than 2 feet fell in a single day.

INTO THE RED CLIMATE AND THE FIGHT OF OUR LIVES

Well, get ready. Climate change is ensuring much more, a new study concludes.

Winters in the northeastern United States could see a doubling of the number of extremely rainy and snowy storms by the end of the century, according to the study, recently published in the journal Climatic Change.

The study looked at how much extreme precipitation the region can expect, finding that the biggest increases will happen in winter and spring. Overall, researchers found that if worldwide fossil fuel use continues to rise through the end of the century, the region can expect an average of 52 percent more extreme precipitation, compared with the period from 1976 through 2005. The study found that most of that additional precipitation will come from an increase in the number of days with extreme precipitation, though it also projects a small increase in the amount of rain or snow on each extreme precipitation day.

"We should be thinking about adapting to this," said Jonathan Winter, an associate professor of geography at Dartmouth and an author of the study. Already, he said, the design of anything from buildings to storm sewers is generally based on historic weather data, not the more severe precipitation predicted by climate models. Now, with the latest information about just how much heavy rain and snow could be in store, he hopes to see it incorporated into policy decisions.

The big takeaway: As the climate warms, annual precipitation will rise and the number of days with extreme

EXTREME WEATHER, Page A10

Study warns of more extreme precipitation

► EXTREME WEATHER Continued from Page A1

precipitation — defined in the paper as roughly 1.5 inches or the equivalent amount of snow, typically about 20 inches — will rise dramatically. In Boston, there was just one day of extreme precipitation last year, but 2021 saw seven, according to Michael A. Rawlins, associate director of the Climate System Research Center at the University of Massachusetts Amherst, who was not involved in the study.

The study further underlines a confounding hallmark of climate change: even wider swings between extreme weather, more years that are abnormally dry, as parts of New England are now, and more years of extreme rainfall.

Major precipitation can have dire consequences, the authors write, including for agriculture. A 2018 study found that from 2013 to 2016, more than a third of crop losses in the Northeast were associated with extreme rainfall, which can lead to the spread of diseases that decimate yields. Extreme rainfall also triggers faster flow in rivers and streams, which can degrade aquatic ecosystems and put bridges at risk. A 2012 study found that as many as 5,000 bridges in New England are vulnerable to flooding brought by climate change-fueled storms.

“As climate change brings warmer temperatures, you have more water vapor in the atmosphere, which creates the right conditions for extreme precipitation,” said Christopher Picard, an undergraduate researcher in Winter’s Applied Hydroclimatology Group at Dartmouth and first author of the study.

To better understand how climate change will affect extreme precipitation, the authors of the study used a region-specific climate model that allowed for a fine-grained examination of climate impact across the New England states, New York, Pennsylvania, New Jersey, Delaware, Maryland, Washington,

D.C., and West Virginia.

Akintomide Afolayan Akinsanola, an assistant professor at the University of Illinois Chicago studying climate variability and change, said the study’s findings are interesting because they include close-up details about how the region is affected, rather than a zoomed-out global look. “We researchers believe that using a much higher resolution, we should be able to get a better or more accurate result,” said Akinsanola, who was not involved in the new study.

For their analysis, the authors used what is known as the high-emissions scenario — essentially a worst-case situation in which the world does not respond to the climate crisis but continues on its path of increasing reliance on fossil fuels. Researchers not involved in the study said that is what is commonly used for these types of assessments because academics and policymakers need to examine the most dire risks.

The authors also looked at a moderate scenario, in which emissions peak around 2040 and then decline. This version of our future is considered in line with keeping warming to roughly 2 degrees Celsius above preindustrial times, a vital threshold that the world’s leading scientists say must be achieved to avert the worst of climate change.

That scenario found the same trend of steady increases, but roughly half the projected increase in average extreme precipitation annually. And instead of a 109 percent increase in winter extreme precipitation, the moderate emissions scenario model projected a 22.7 percent increase.

Ellen Douglas, associate dean of the School for the Environment at the University of Massachusetts Boston, who was not involved in the new study, said this latest work helps refine our understanding of precipitation in the region in the future. Douglas was the coauthor of a report last year by the



JESSICA RINALDI/GLOBE STAFF/FILE/2015

More storms with large amounts of snow and rain could be ahead for the region.



PAT GREENHOUSE/GLOBE STAFF/FILE/2020

Greater Boston Research Advisory Group, which examined the risks Boston faces from climate change and projected a 20 to 30 percent increase in extreme precipitation by the end of the century. Douglas said the higher, 50 percent, projection in the new report could be explained by the use of different models.

Uncertainty is inherent in modeling, especially when it

comes to precipitation, she said. But research into the questions of how climate relates to precipitation and what to expect in the future is key if the region is going to adequately adapt to what is coming.

“Even though we don’t quite know the magnitude of increase in extreme precipitation, the fact that it will increase with warming is based on physics (warmer air holds more mois-

ture ... what the paper calls ‘precipitable water’) so projections of increased extreme precipitation are very certain,” she said.

And whether that is an increase by 20 percent or an increase by 50 percent, she said, either way, “it’s a lot.”

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