The New York Times

Climate Change
Supporting Documents

Teach About Climate Change With These 24 Graphs

30 Climate Change Graphs

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WHAT'S GOING ON IN THIS GRAPH?

Teach About Climate Change With These 24 New York Times Graphs

By Michael Gonchar
Feb. 28, 2019

Update, Feb. 3, 2024: We published a new collection of 30 graphs related to climate change.

Climate change is a gradual process. If you simply measure air temperature, atmospheric carbon dioxide or sea-ice thickness in any given year, you won't be able to see the full picture of how the planet's weather patterns are changing. That's why graphs showing change over time can be such a powerful teaching resource to help students better understand climate trends.

In this teaching resource, we have gathered 24 graphs previously published elsewhere in The New York Times that relate to climate change. In the first section, we discuss teaching strategies for using these graphs in the classroom. In the second section, we present a collection of graphs organized by topic: melting ice, rising seas, changing ocean temperature, changing air temperature, rising carbon emissions, impacts on humans, intensifying storms and contradicting attitudes.

Part I: Strategies for Teaching With Graphs

Each week in "What's Going On in This Graph?," we spotlight an engaging graph previously published elsewhere in The Times and pair it with a simple set of questions: What do you notice? What do you wonder? What do you think is going on in this graph? On Wednesdays, teachers from the American Statistical Association provide live facilitation in our comments section to respond to students as they post analyses and consider what story the graph is telling. Then, at the end of the week, we add an end-of-activity "reveal" that shares the original article containing the graph, highlights from the moderation, related statistical concepts and helpful vocabulary.

The philosophy behind our approach is to let students begin analyzing graphs with the skills they will most naturally and successfully use — simple noticing and wondering. From there, students can simultaneously build confidence and acquire new conceptual understanding. Over time, as their critical thinking skills develop and their vocabulary grows, students' analyses become more sophisticated.

Below, we detail step-by-step instructions for how to adapt this approach to teaching with graphs to your classroom, and we provide examples from students who have participated in our weekly conversations about climate change-related graphs.

1. What do you notice?

In this Stats and Stories podcast, Sharon Hessney, the curator of "What's Going On in This Graph?," describes the benefits of the Notice & Wonder approach: "Noticing and wondering has a 'low floor and a high ceiling.' Every student can notice something in a graph. There are dots on it; it's about different countries. As they hear each other's noticings, they dig deeper. They'll discover more by comparing and contrasting aspects of the graph and by relating these noticings to the world they know."

So, what can simply noticing look like in action? Here are examples of what students noticed about the above graph about summer temperatures in the Northern Hemisphere.

> I noticed that the graph is only focusing on the summer temperatures, and not the overall temperatures. The base year has a 29-year difference while the other years have a 10-year difference. The graph does not cover the years 1981-1982. — Deija Robins from California

> I noticed that as the years go by, the mean or the center of the graph shifts farther to the right. This upward trend seems to be in a stage of rapid acceleration and I wonder if it will continue to increase at the same rate in the coming years. — Brooke Shalam from New York City

> I noticed that as the years went on the temperatures became hot and extremely hot more frequently. I also noticed that the distribution of the temperatures starts as an approximately symmetric distribution and becomes skewed right over the years. — Chandler B from Georgia

2. What do you wonder?

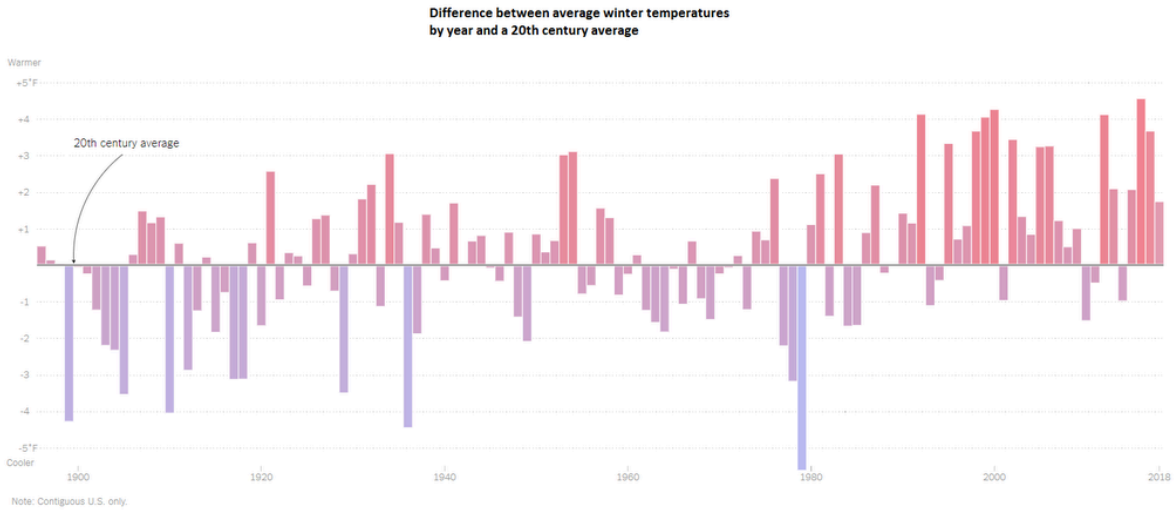
Discussing what students notice and wonder, either online or in the classroom, is an important part of the learning process. Ms. Hessney recommends: “We think the best practice for doing ‘What’s Going on in This Graph?’ is first, for students to converse about what they notice and wonder either individually or in small groups, and then to discuss as a whole class. By hearing other people’s ideas, students form more and deeper stories from the graph.”

Here are examples of student wonderings about the same graph.

> I wonder if the progressing extreme heat will affect our animals and even, human beings. Will this affect us in dangerous ways? For example, will we die from heat stroke, Will the water sources dry up and the animals die of thirst? These are my wonders for this graph. — Ruby Casey from New Hampshire

> We wonder what “extremely cold,” “normal” etc. means in terms of temperatures. We also wondered if there were outliers at all. It seems like there were outliers on the hot side and then outliers on the cold side. We wonder if something similar is happening in the southern hemisphere and if this type of trend happens in the winter, too. We also wonder if these are actual temperatures and where was the data gathered — cities, country, novice weather people as opposed to trained weather people We think that global warming is being illustrated by this graph. — @mathteacher24 from Bethlehem, Pa.

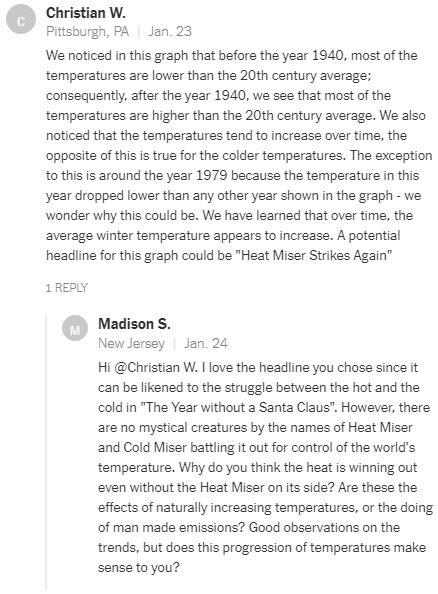
3. Discuss.



Where Are America’s Winters Warming the Most?

An essential part of our approach to teaching with graphs is that students don’t do their thinking in a vacuum. On The Learning Network, moderators from the American Statistical Association provide students with feedback on their comments. Plus, students get to read what others have to say, and have a chance to reply as well — whether they are in the same classroom or on the other side of the globe.

In the screen shot below, you can see a student, Madison from New Jersey, responding to Christian in Pittsburgh. One of the questions Madison asks is, “Are these the effects of naturally increasing temperatures, or the doing of man made emissions?”



Christian W.
Pittsburgh, PA | Jan. 23

We noticed in this graph that before the year 1940, most of the temperatures are lower than the 20th century average; consequently, after the year 1940, we see that most of the temperatures are higher than the 20th century average. We also noticed that the temperatures tend to increase over time, the opposite of this is true for the colder temperatures. The exception to this is around the year 1979 because the temperature in this year dropped lower than any other year shown in the graph - we wonder why this could be. We have learned that over time, the average winter temperature appears to increase. A potential headline for this graph could be "Heat Miser Strikes Again"

1 REPLY

Madison S.
New Jersey | Jan. 24

Hi @Christian W. I love the headline you chose since it can be likened to the struggle between the hot and the cold in "The Year without a Santa Claus". However, there are no mystical creatures by the names of Heat Miser and Cold Miser battling it out for control of the world's temperature. Why do you think the heat is winning out even without the Heat Miser on its side? Are these the effects of naturally increasing temperatures, or the doing of man made emissions? Good observations on the trends, but does this progression of temperatures make sense to you?

4. What's going on in this graph?

Just like photographs, graphs tell stories. After students have "noticed and wondered," we ask them: What's going on in this graph? What story can it tell?

Here are some examples of the comments students made about the above graph about winter temperatures.

> This graph shows that although the average winter temperature in the US is not increasing at a steady rate, overall the temperatures are getting warmer with time. This is in favour of the discussion about climate change causing global warming. — Tatyana from New Zealand

> This graph depicts how the winter temperatures from the 1900s differ from the 2000s. And how the temperatures are gradually getting warmer. This could be happening due to global warming or maybe how they say the sun is gradually getting closer and closer to our planet. — Matthew Laing from Philadelphia

> From brief observations, I can conclude that this is a graph depicting the differences between the average winter temperature in 1900 and the present average winter temperature at the time. Because of this, I'm curious if an increase in air pollution, carbon dioxide, and deforestation is responsible for the overall increase of winter temperatures on Earth. This graph could capture how pollution and an increase of carbon dioxide within the atmosphere because the gas prevents small bits of heat from the sun from escaping the Earth's atmosphere, forcing it to bounce back to the Earth's surface as more thermal energy from the sun reaches our planet. A similar phenomenon has been present on Venus, which, due to the gases within Venus' atmosphere capturing the majority of thermal energy from the sun, has made Venus the hottest planet in the Solar System. — Ben S. from Allen Tex.

5. Come up with a catchy headline.

This past summer Robert Lochel, a math teacher in the Hatboro-Horsham School District, mentioned to us that he always asked students to write a catchy headline after they were done noticing and wondering. We liked the idea so much, we added it to our weekly protocol.

Here are a few examples of students' headlines about the graph above.

- "You Thought This Winter Was Cold? Check This Graph," by Nathan of Virginia
- "Is Earth on the Hot Seat?," by Kero K. and Jon I. from Hampton High School
- "Dreaming of a Green Christmas," by Isaac from Hampton High School
- "Doomsday Deviation," by Michael, Harper, Joseph and Owen from Hampton High School

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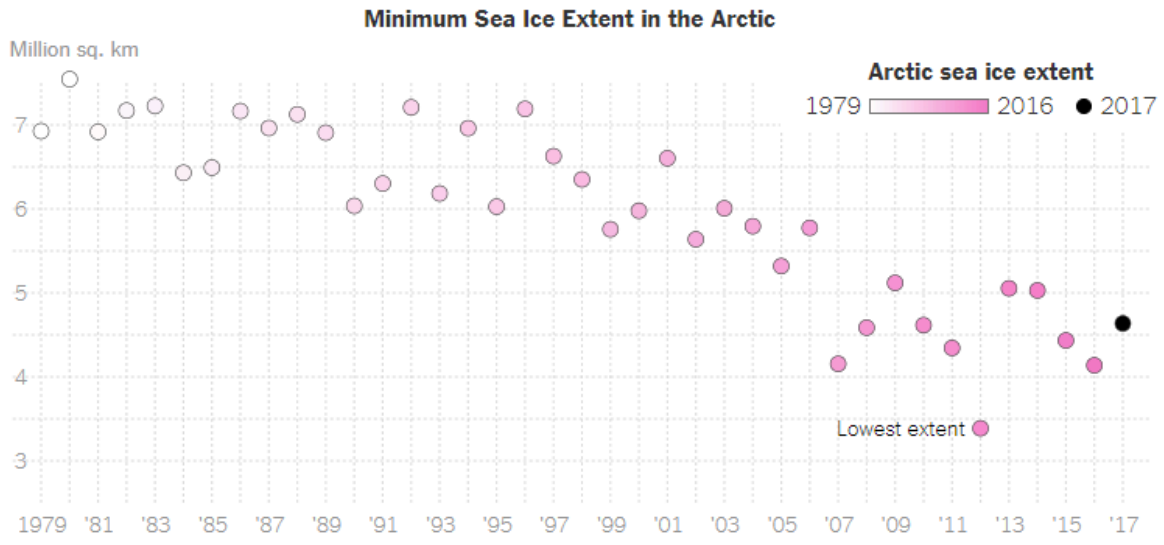
Part II: A Collection of Climate Change-Related Graphs by The Times

The graph above illustrates how rising temperatures could affect ice cover across 1.4 million lakes in the Northern Hemisphere. It is one of scores of graphs related to climate change that The Times has published in the last few years. We hope that by collecting a selection of these graphs in one place, organized by topic and accompanied by links to the original Times articles, we are providing teachers with a valuable resource for teaching about climate trends.

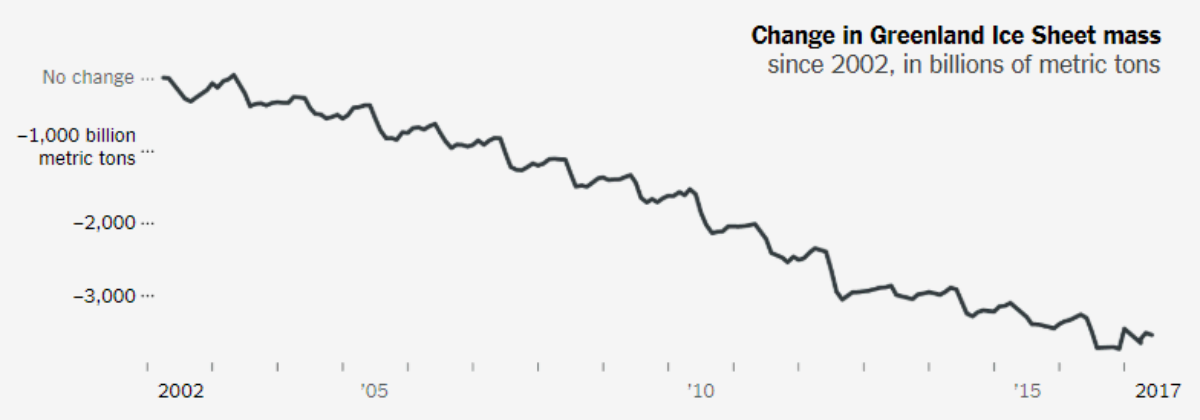
With any one of these graphs, you can have students notice, wonder and do the sequence of strategies recommended above.

And here is one more teaching idea: Choose a handful of these graphs and ask students to select the one they think is most valuable for teaching the general public about Earth's changing climate. Then they can explain why they selected that graph.

Melting Ice



We Charted Arctic Sea Ice for Nearly Every Day Since 1979. You'll See a Trend. | *Arctic sea ice has been in a steep decline since scientists started using satellites to measure it 40 years ago. And the 10 lowest ice extents have all been recorded since 2007.*

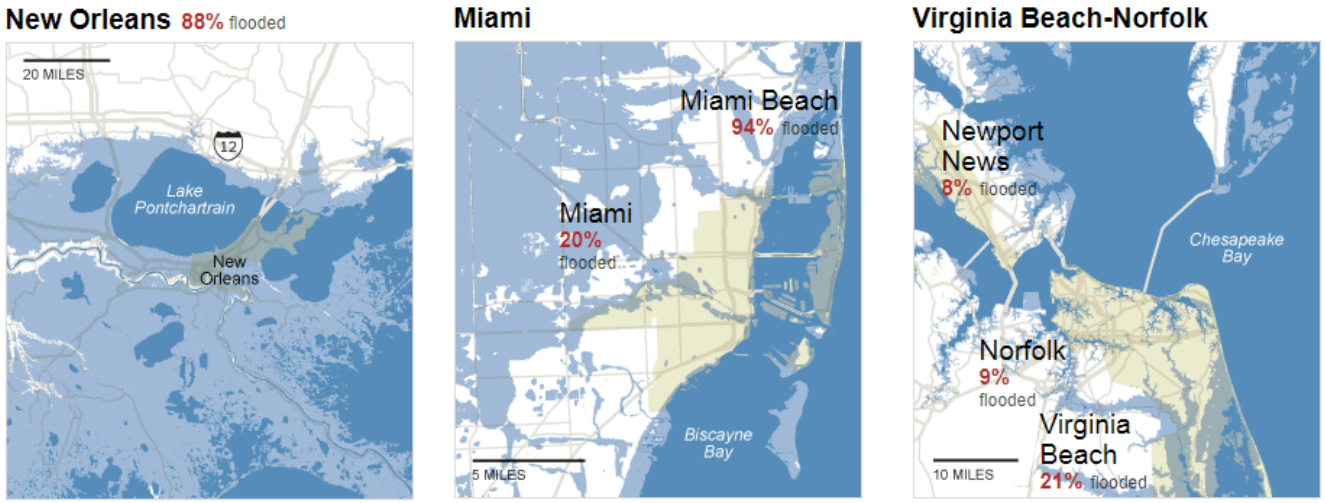


Source: The European Space Agency Climate Change Initiative

As Greenland Melts, Where's the Water Going? | *Each year, Greenland loses 270 billion tons of ice as the planet warms. New research shows that some of the water may be trapped in the ice sheet, which could change how scientists think about global sea levels.*

In the Arctic, the Old Ice Is Disappearing | *In the winter of 2018, the Arctic Ocean hit a record low for ice older than five years. Scientists say that summers in the Arctic may be ice-free in the future.*

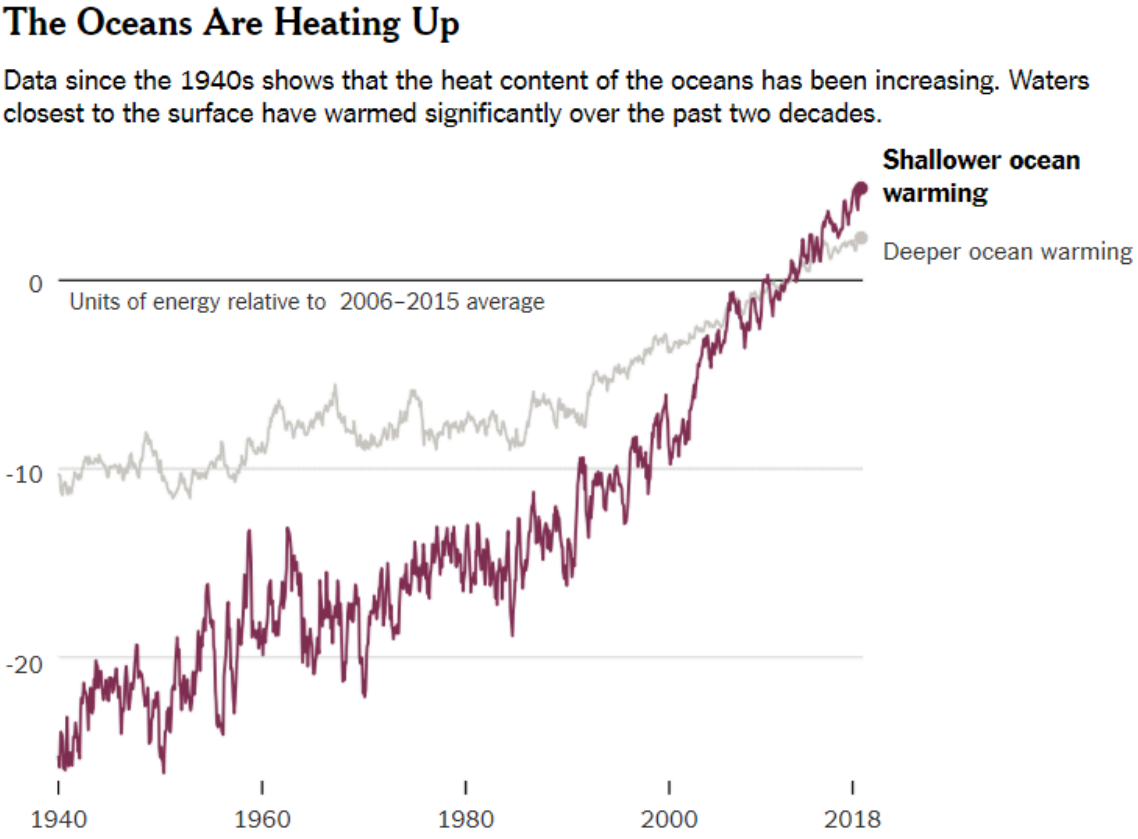
Rising Seas



Sources: Remik Ziemlinski, Climate Central; U.S. Geological Survey; National Oceanic and Atmospheric Administration; U.S. Fish and Wildlife Service

What Could Disappear | *These 2012 maps show coastal and low-lying areas that would be permanently flooded, without engineered protection, with a five-foot sea level rise over the current level. Percentages are the portion of dry, habitable land within the city limits of places listed that would be permanently submerged.*

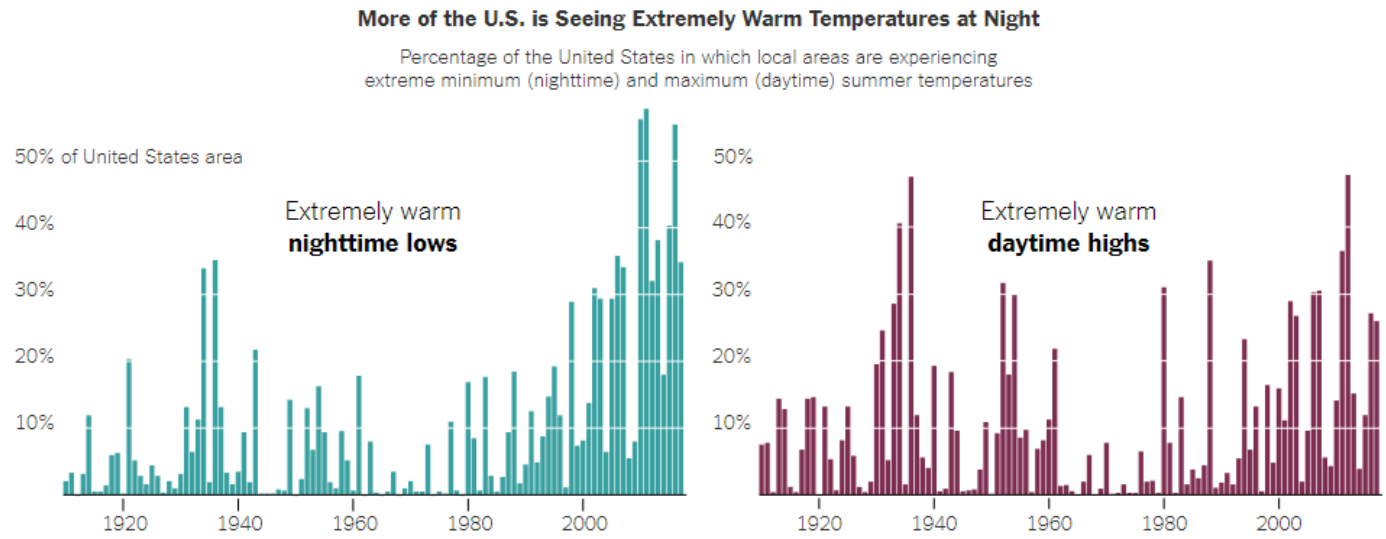
Changing Ocean Temperature



Note: Shallower ocean warming describes depths between 0 and 700 meters. Deeper ocean warming is between 700 and 2,000 meters. By The New York Times | Source: Lijing Cheng et al., Institute of Atmospheric Physics, Beijing

Ocean Warming Is Accelerating Faster Than Thought, New Research Finds | *An analysis concluded that Earth's oceans are heating up 40 percent faster on average than a United Nations panel estimated five years ago, a finding with dire implications for climate change.*

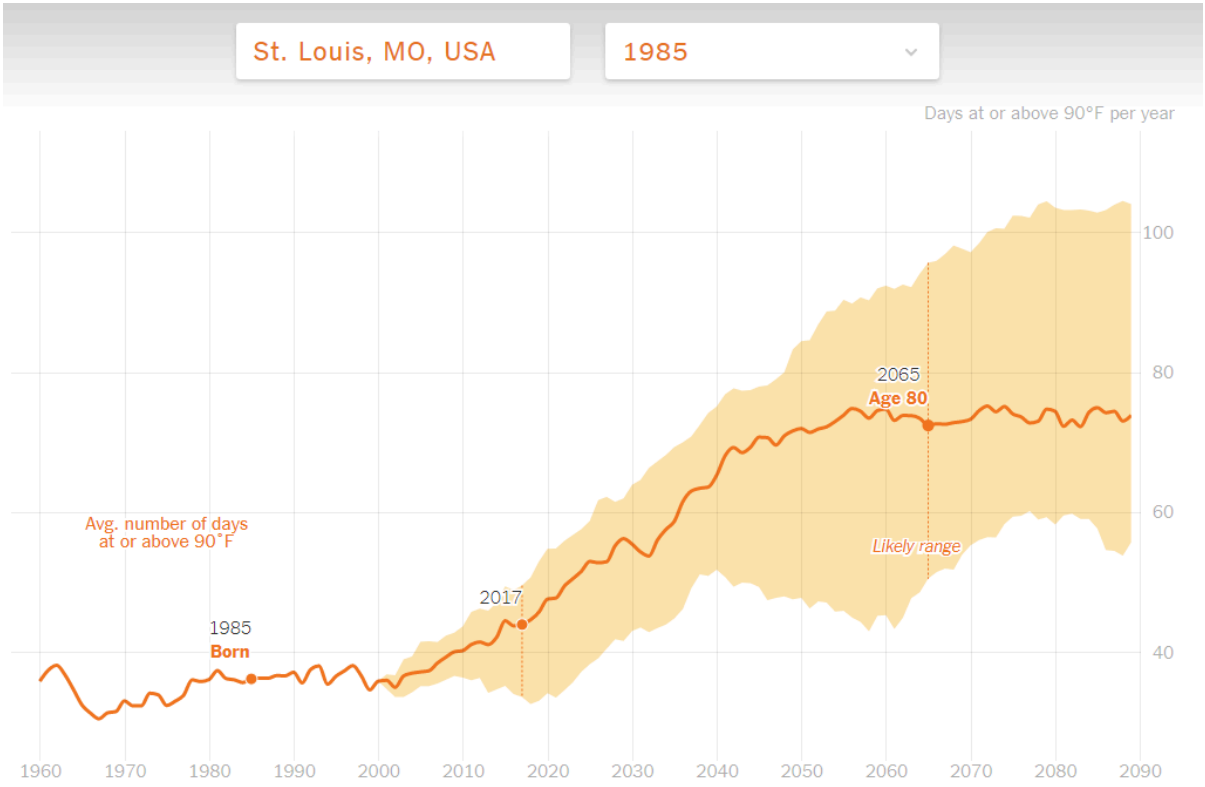
Changing Air Temperature



Source: National Oceanic and Atmospheric Administration | NOAA defines extremely hot temperatures as those in the top 10 percent for the local period of record.

Nights Are Warming Faster Than Days. Here's Why That's Dangerous. | *Nationwide, summer evening temperatures have risen at nearly twice the rate of daytime temperatures, putting older people, the sick, and young children at greater risk during heat waves.*

It's Official: 2018 Was the Fourth-Warmest Year on Record | *The Earth's temperature in 2018 was more than one degree Celsius, or 1.8 degrees Fahrenheit, above the average temperature of the late 19th century, when humans started pumping large amounts of carbon dioxide into the atmosphere.*

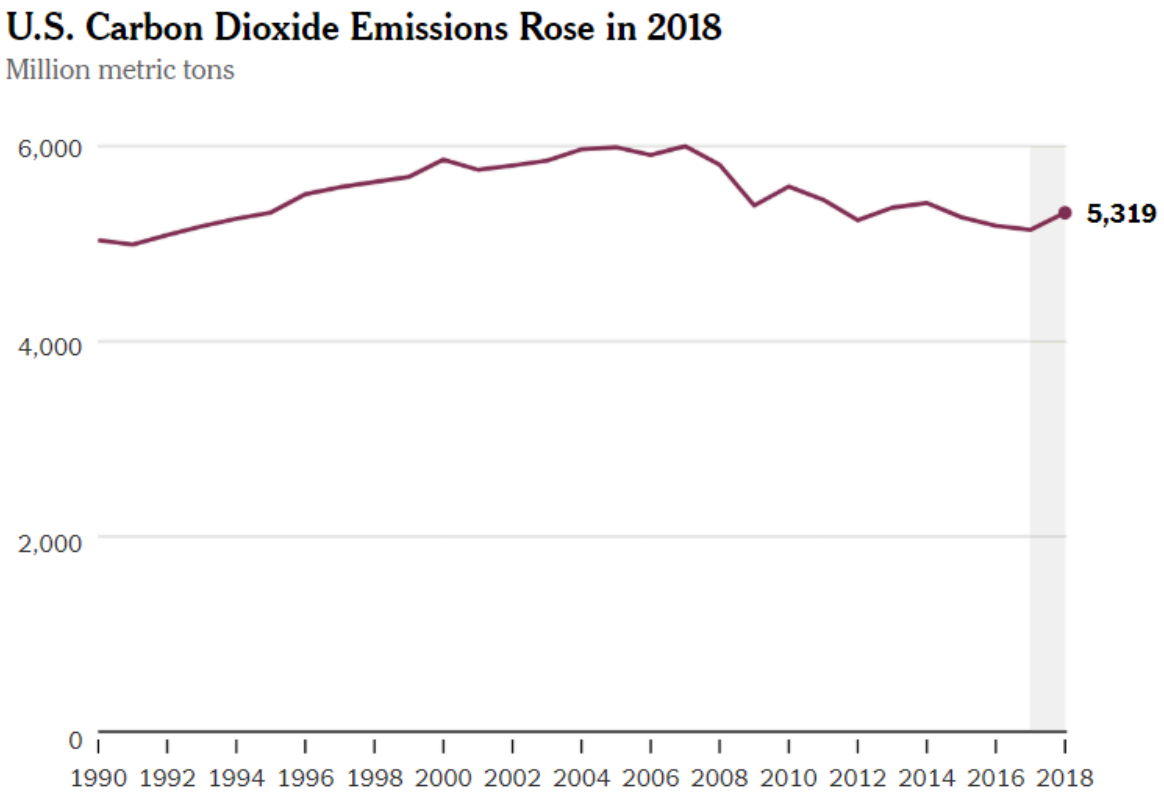


How Much Hotter Is Your Hometown Than When You Were Born? | *As the world warms because of human-induced climate change, most of us can expect to see more days when temperatures hit 90 degrees Fahrenheit (32 degrees Celsius) or higher. See how your hometown has changed so far and how much hotter it may get.*

Of 21 Winter Olympic Cities, Many May Soon Be Too Warm to Host the Games | *Because of climate change, by midcentury many prior Winter Games locations may be too warm to ever host the Olympics again.*

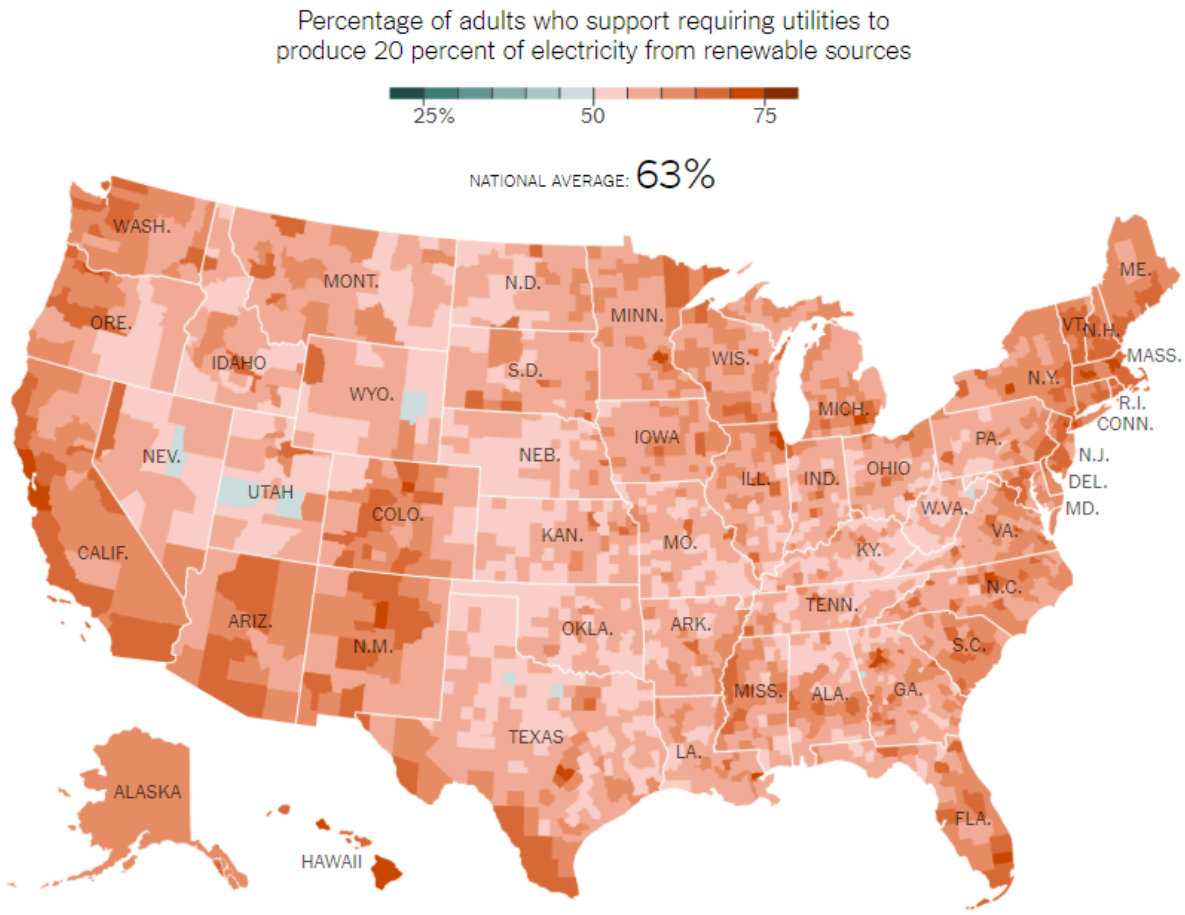
Rising Carbon Emissions

Here's How Far the World Is From Meeting Its Climate Goals | *This 2017 graph shows how two years after countries signed a landmark climate agreement in Paris, the world remains far off course from preventing drastic global warming in the decades ahead.*



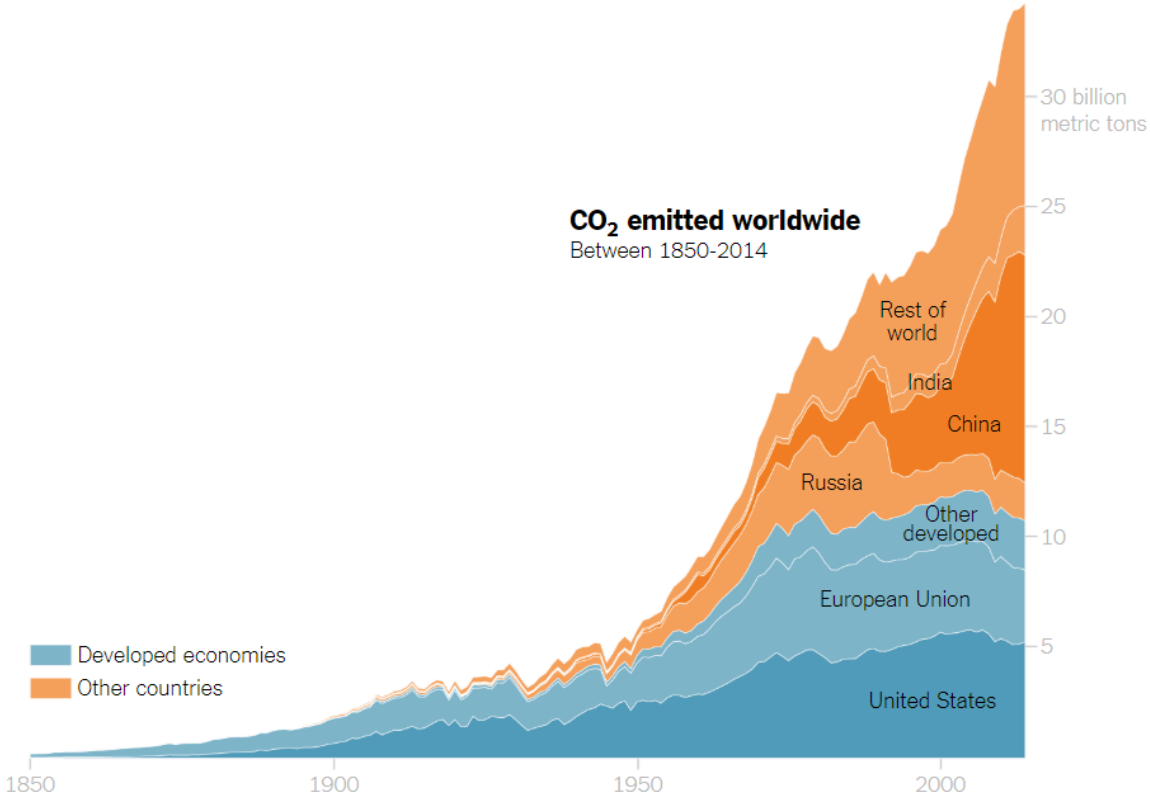
By The New York Times | Rhodium U.S. Climate Service

U.S. Carbon Emissions Surged in 2018 Even as Coal Plants Closed | *America's carbon dioxide emissions rose by 3.4 percent in 2018, the biggest increase in eight years.*



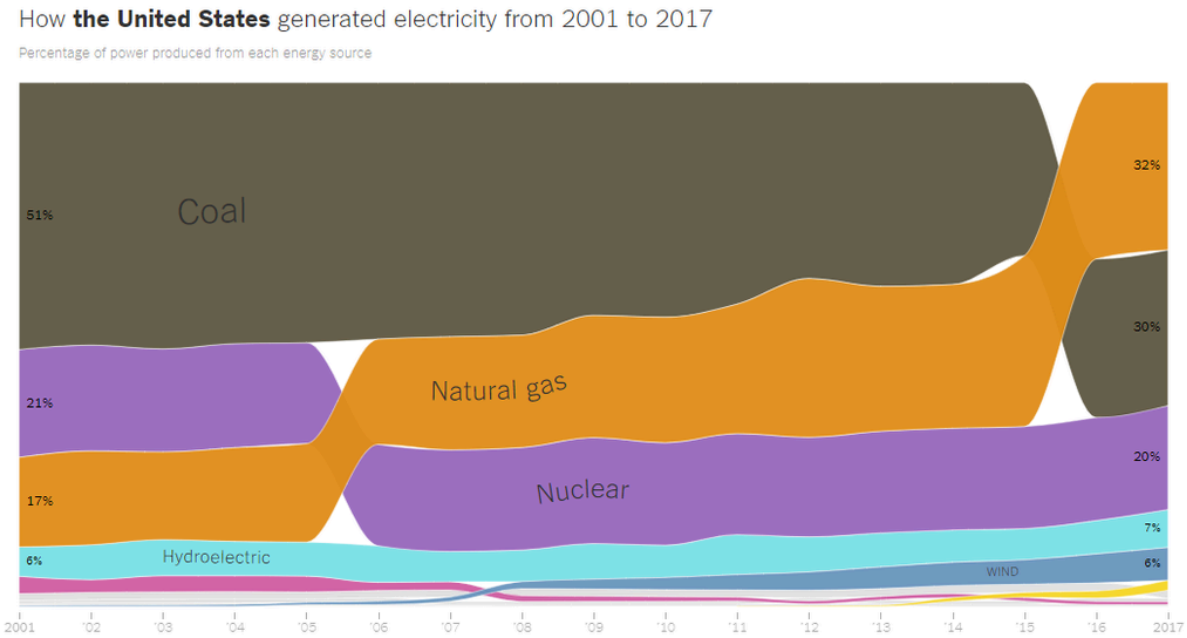
County-level opinion data are estimates based on survey responses from more than 22,000 American adults (age 25 and older) collected between 2008 and 2018. Source: Yale Program on Climate Change Communication

Where Americans (Mostly) Agree on Climate Change Policies, in Five Maps | *Americans are politically divided over climate change, but there's broader consensus around some of the solutions.*



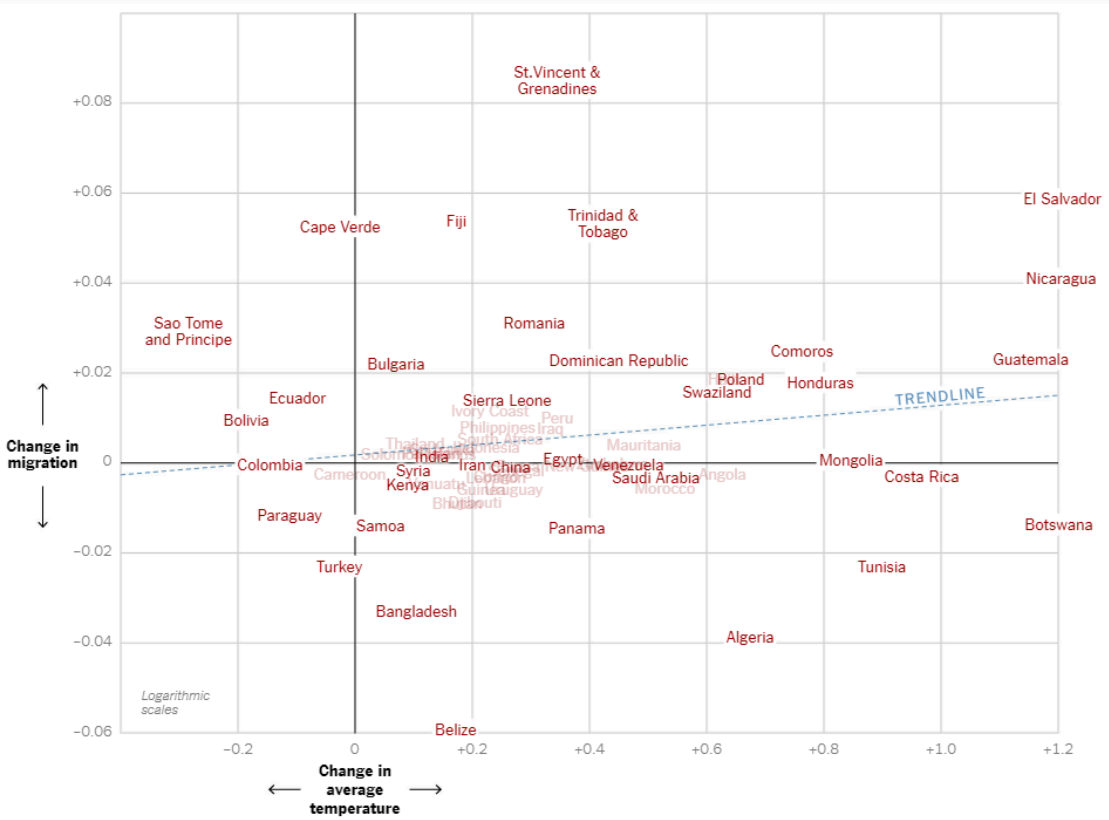
Source: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory; country classifications via United Nations Total CO2 emissions are from fossil fuels and cement production and do not include land use and forestry-related emissions. In the worldwide carbon emissions graphic (middle), Russia data includes the U.S.S.R. through 1991, but only the Russian Federation afterward.

The U.S. Is the Biggest Carbon Polluter in History. It Just Walked Away From the Paris Climate Deal. | *The United States, with its love of big cars, big houses and blasting air-conditioners, has contributed more than any other country to the atmospheric carbon dioxide that is scorching the planet.*



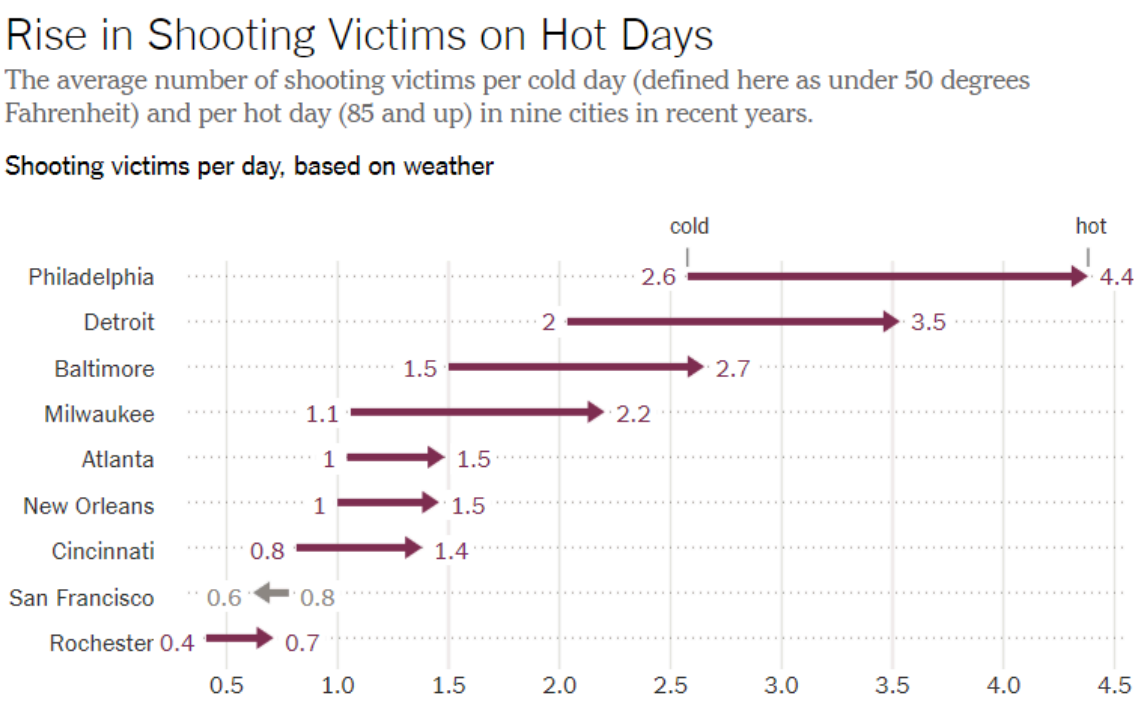
How Does Your State Make Electricity? | *Over all, fossil fuels still dominate electricity generation in the United States. But the shift from coal to natural gas has helped to lower carbon dioxide emissions and other pollution.*

Affecting Humans



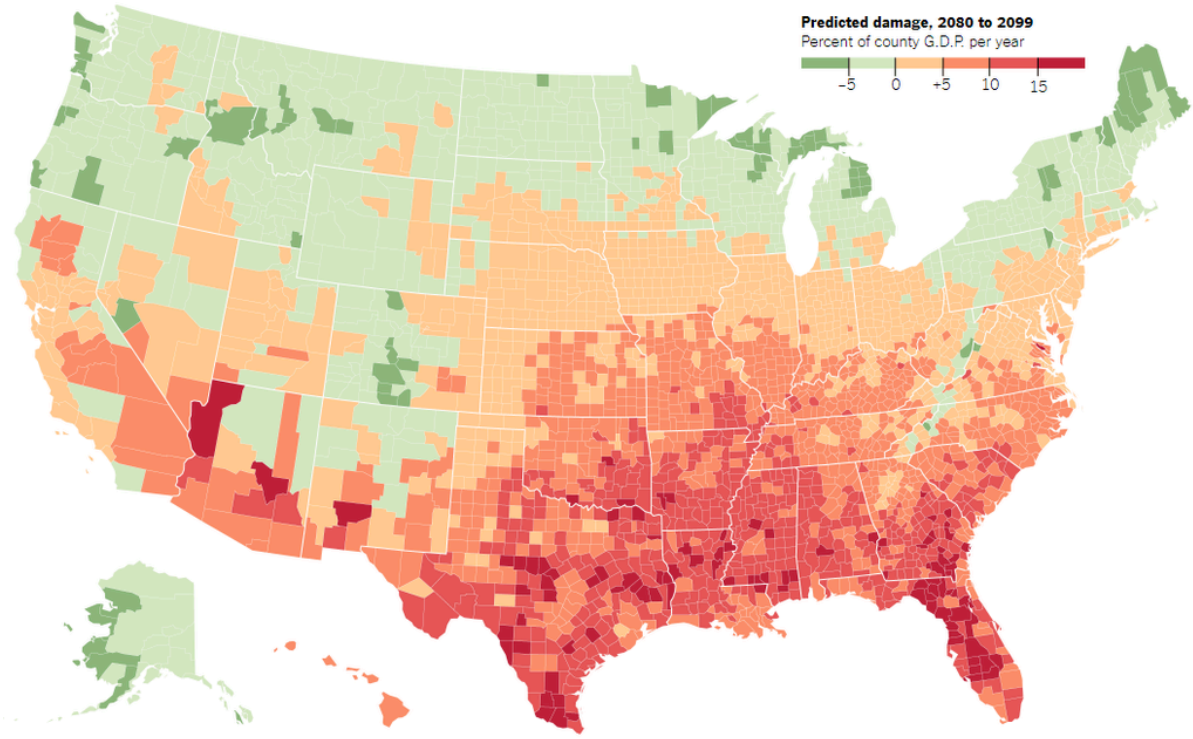
Notes: The horizontal axis records the natural logarithm of the average temperatures between 2000 and 1981 minus the natural logarithm of the average temperatures between 1960 and 1980. The vertical axis records the difference between the natural logarithms of the average emigration rates between 1990 and 2000 and the emigration rates between 1970 and 1980. | Source: Cristina Cattaneo (Fondazione Eni Enrico Mattei (FEEM)) and Giovanni Peri (University of California, Davis)

Migrants Are on the Rise Around the World, and Myths About Them Are Shaping Attitudes | *Rising average temperatures are already pushing people from their homes in many middle-income countries, according to research by Cristina Cattaneo and Giovanni Peri, increasing migration from rural areas to urban centers and across borders to other nations. As warming continues in the coming decades, it will probably push people from agricultural areas to urban areas and from the global South to the richer global North.*



Fatal and nonfatal shooting victim data for Cincinnati (2008-present), Rochester (2000-present), San Francisco (2012–2017), Baltimore (2011-present), Philadelphia (2015-present), New Orleans (2010-present), Atlanta (2012–17) and Chicago (below, 2014-present). Nonfatal shooting victim data for Detroit (2014–2016) and Milwaukee (2011-May 2016). Jeff Asher

A Rise in Murder? Let's Talk About the Weather | *The correlation between heat and crime suggests the need for more research on shootings in American cities.*

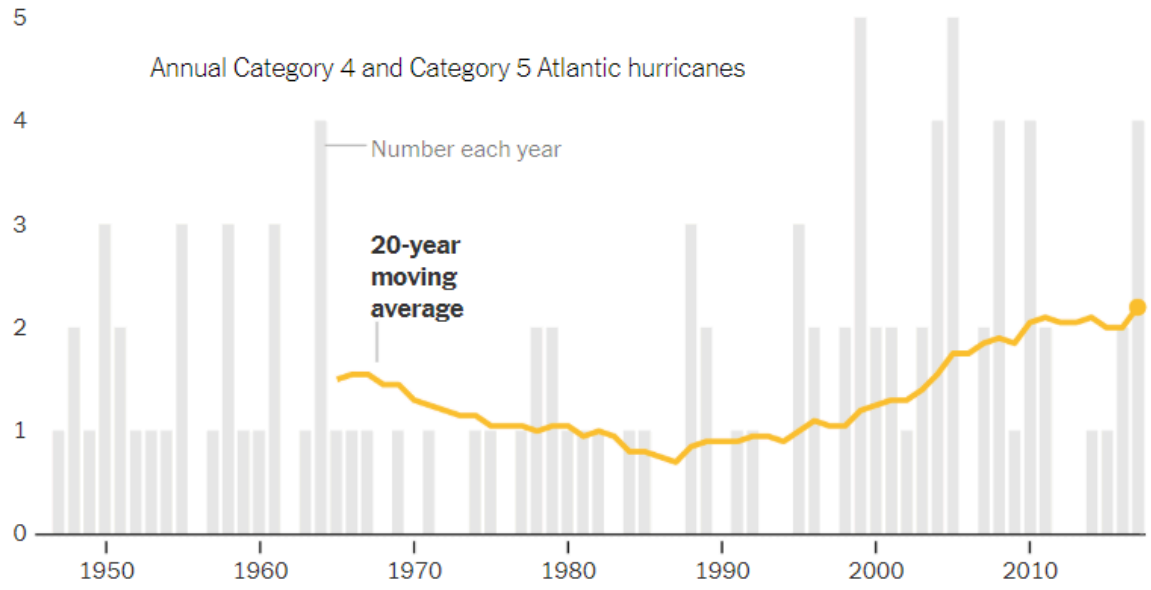


The map shows median estimates of economic damage per year in 2080 to 2099 under a high-emissions scenario (RCP8.5). Damage is calculated as a percentage of county G.D.P., factoring in agriculture, mortality, crime, labor productivity, coastal impacts and energy demand. Counties with negative damage (green) are projected to see economic benefits. In the chart, the ranges labeled "likely" refer to outcomes with a two-thirds chance of occurring. Source: Hsiang, Kopp, Jina, Rising et al., 2017

As Climate Changes, Southern States Will Suffer More Than Others | *As the United States confronts global warming in the decades ahead, not all states will suffer equally. Maine may benefit from milder winters. Florida, by contrast, could face major losses, as deadly heat waves flare up in the summer and rising sea levels eat away at valuable coastal properties.*

Intensifying Storms

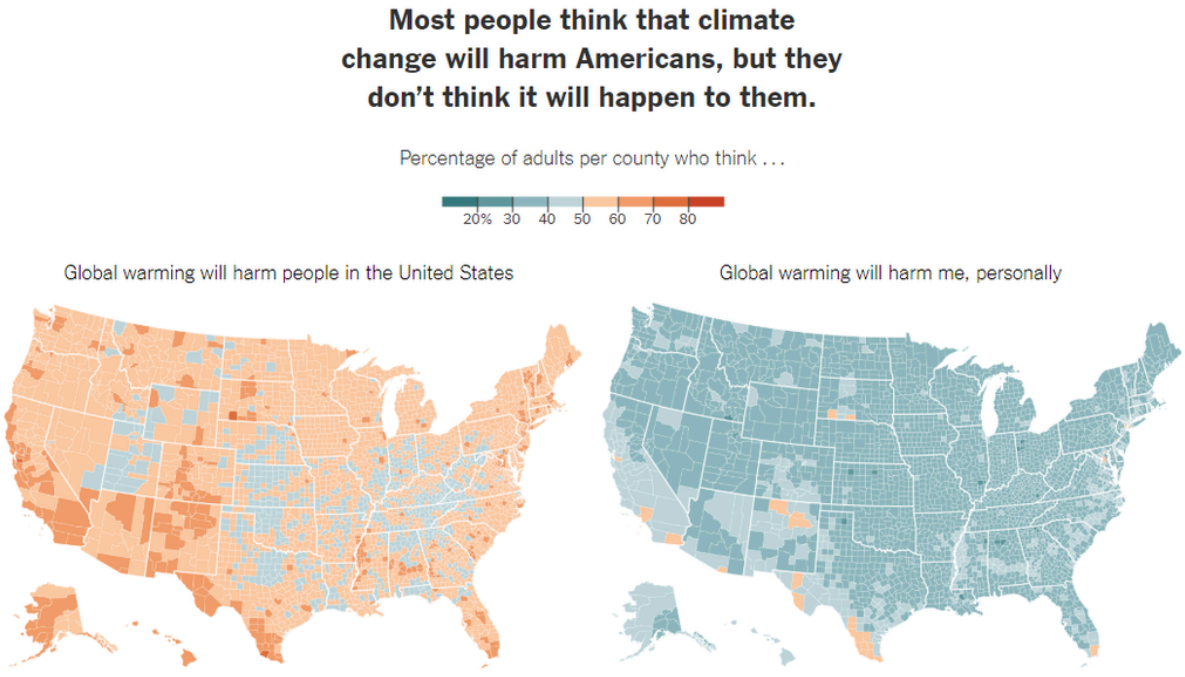
The Cost of Hurricane Harvey: Only One Recent Storm Comes Close | *The graph above, from Sept. 1, 2017, compares more than $200 billion natural disasters since 1980. Note that it does not include major storms that occurred after Hurricane Harvey, including Hurricanes Maria, Irma, Florence and Michael.*



By The New York Times | Source: National Hurricane Center; data on hurricanes is considered most reliable since geostationary satellites began tracking them in the 1970s.

The Story of 2018 Was Climate Change | *David Leonhardt writes: "From year to year, the number of serious hurricanes fluctuates. But the last few decades show a clear and disturbing trend."*

Contradicting Attitudes



County and district-level opinion data are estimates based on survey responses from more than 18,000 American adults (age 25 and older) collected between 2008 and 2016. Source: Yale Program on Climate Change Communication

How Americans Think About Climate Change, in Six Maps | *This 2017 article reports that Americans overwhelmingly believe global warming is happening and that carbon emissions should be scaled back. But fewer are sure that the changes will harm them personally.*

What graphs related to climate change would you want to see?

Students studying climate change might have other data sets in mind they would like to see graphed. For example, perhaps they are interested in retreating glaciers or regional changes in precipitation. You could have students research topics that interest them, find relevant quantitative data and create their own graphs.

We would love to hear about any climate change-related graphs your students create — or about topics you would like to see The Times illustrate in graphs. Post in our comments, or write to us at LNFeedback@nytimes.com — and if your students make some great graphs, be sure to send us photos too since we would love to show them off on our site and on social media.

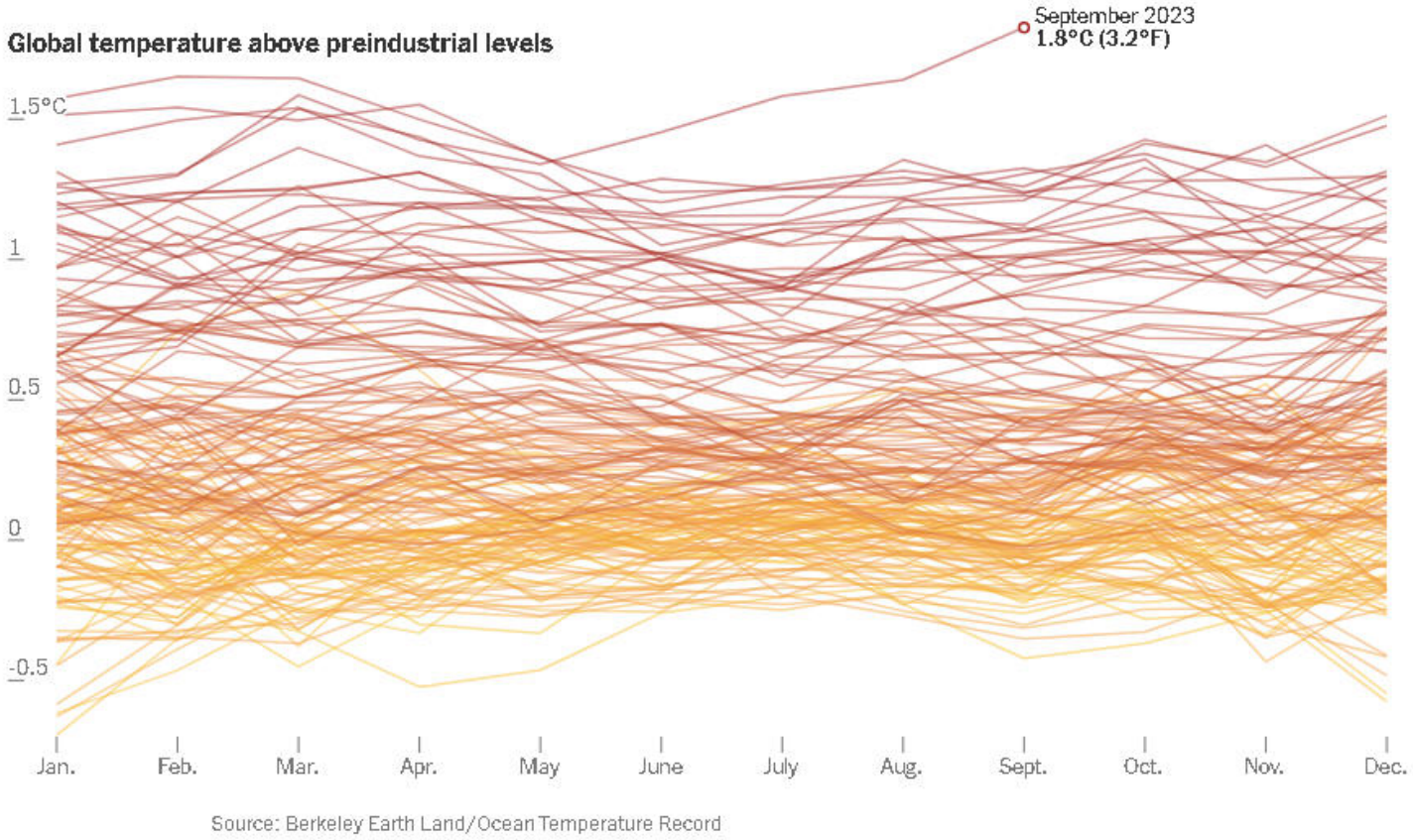
Sharon Hessney helped to curate this selection of climate change-related graphs.

The New York Times https://www.nytimes.com/2024/01/31/learning/lesson-plans/teach-about-climate-change-with-30-graphs-from-the-new-york-times.html

WHAT'S GOING ON IN THIS GRAPH?

Teach About Climate Change With 30 Graphs From The New York Times

A new collection to explore our planet's warming oceans, intensifying storms and rising air temperatures, as well as its greenhouse gas emissions and climate solutions.



By Michael Gonchar

Jan. 31, 2024

How can we help students really see climate change when it is a planet-wide process gradually unfolding over decades? Any given hurricane, prolonged drought or scorching hot day (or summer) might be more likely to occur because of the changing climate. But there will always be weather anomalies; just like in sports, records will be set.

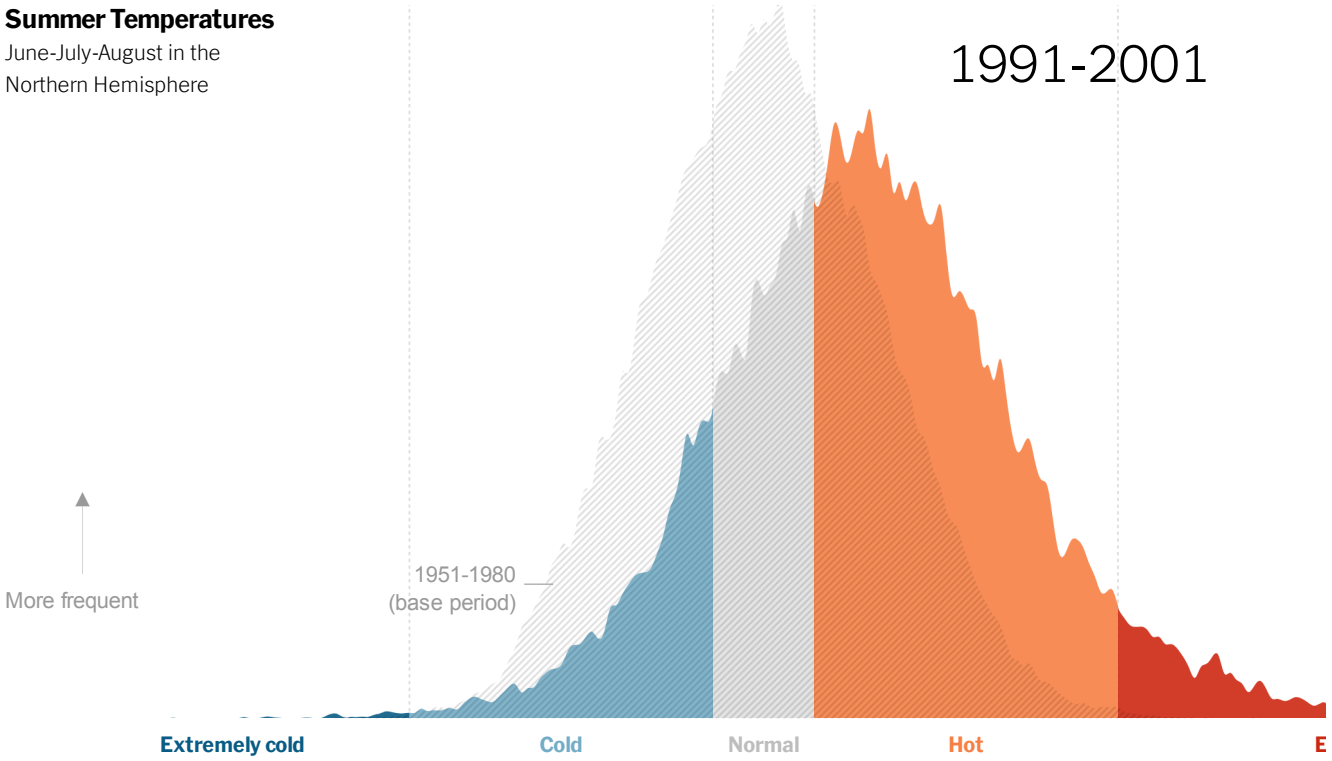
Images can be very powerful (like a video of a starving polar bear), and they can be an important resource in helping young people to see the effects of a warming planet. But perhaps no visual can tell the story of climate change more succinctly, and more effectively, than graphs. Because a single graph can show change over time.

In this teaching resource, we have gathered 30 graphs previously published in The New York Times that relate to climate change. We organize them by topic: rising air temperature, intensifying storms and changing precipitation, warming oceans, greenhouse gas emissions, and climate solutions. Above each graph you'll find the link to the original Times article. Scroll down to the bottom of this post to find teaching strategies for using one or more of these graphs in your classroom.

Note: For more climate-related graphs, visit this post from 2019.

Rising Air Temperature

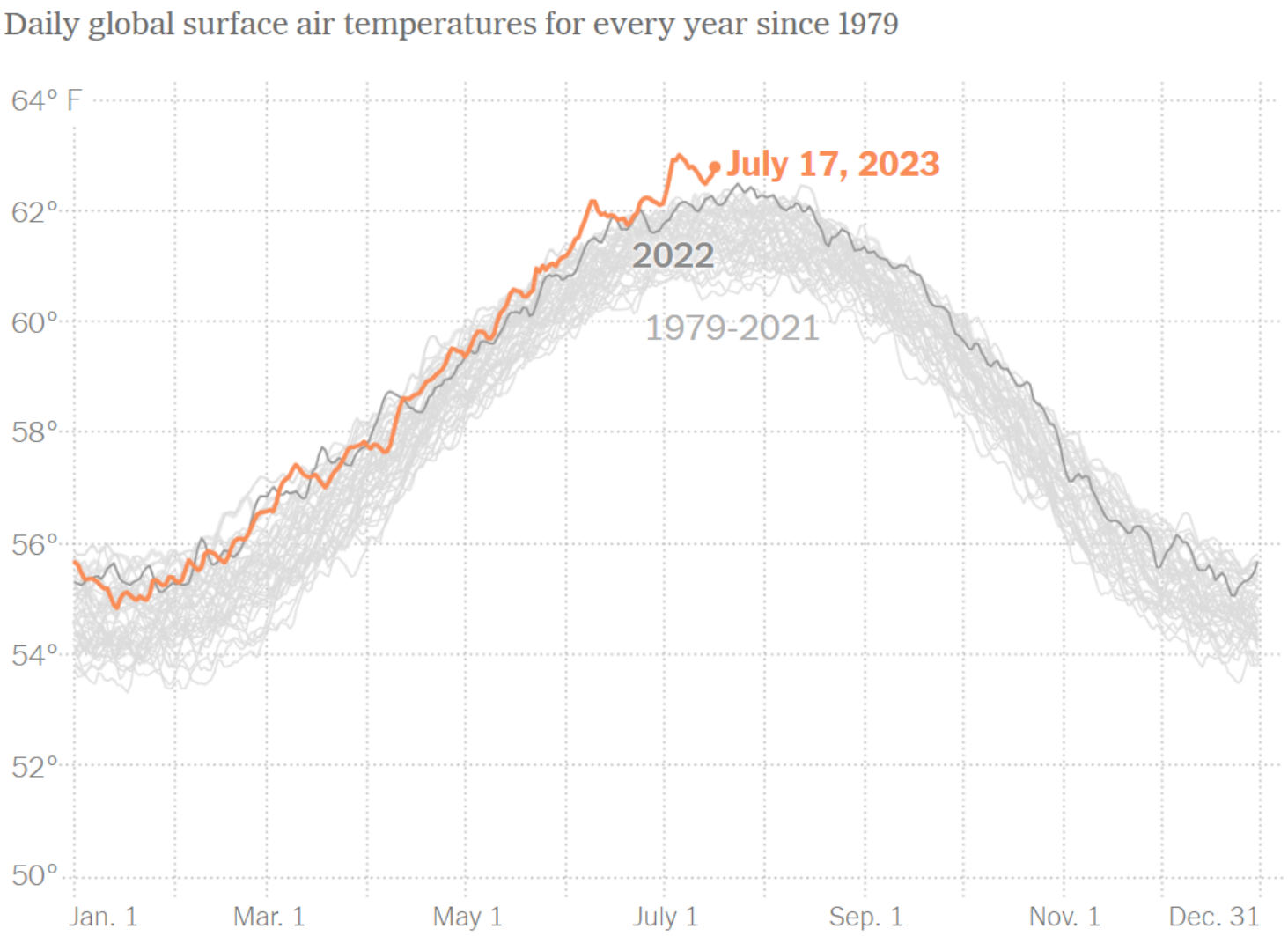
Graph 1: From "It's Not Your Imagination. Summers Are Getting Hotter."



Notes: Temperature categories are determined by the normal distribution for the baseline period, 1951 to 1980, so that about a third of temperatures fall in each of the main three categories: hot, cold and normal. Summer temperatures for each subsequent decade are compared to

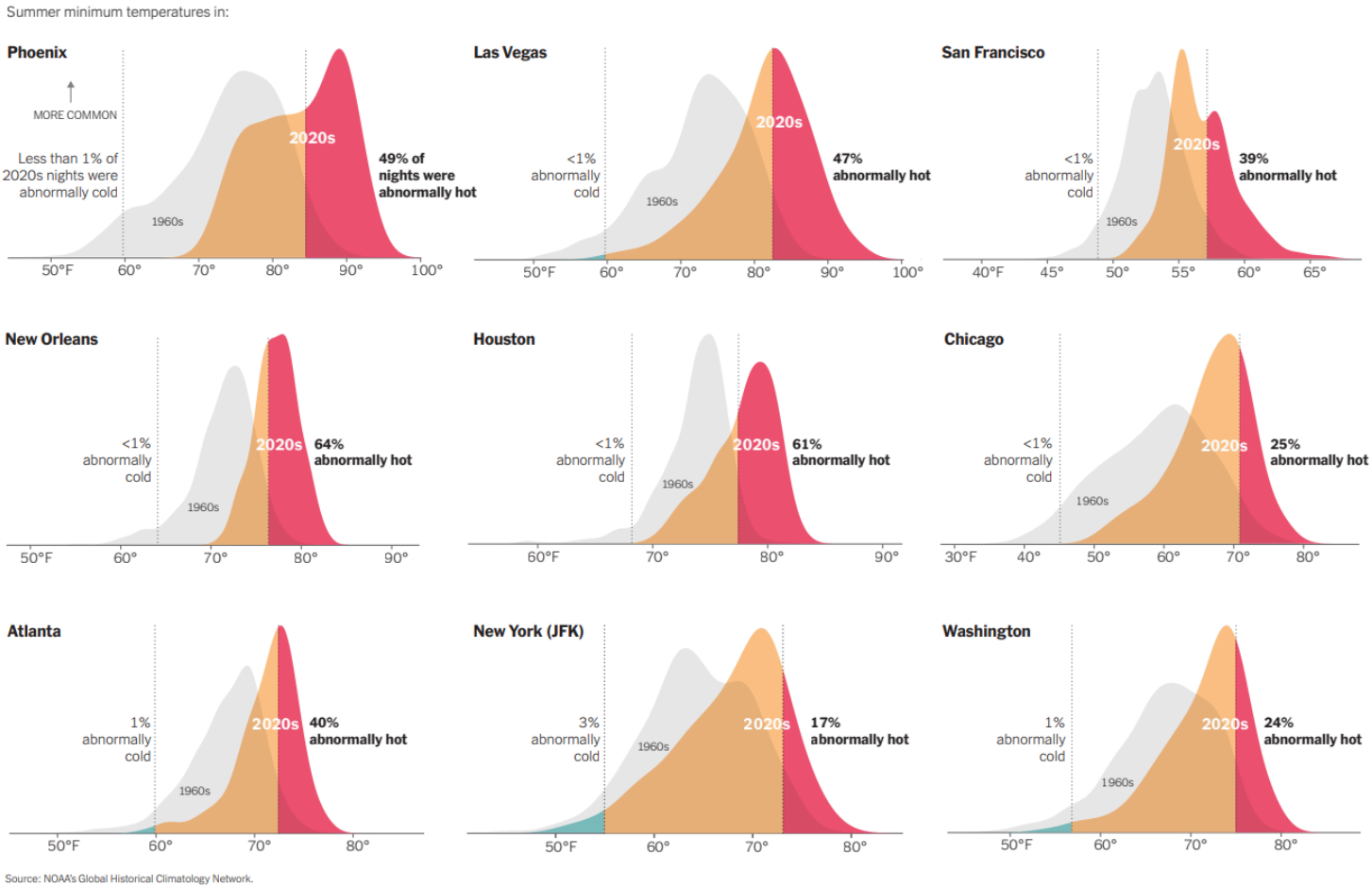
the 1951 to 1980 baseline. Source: Makiko Sato and James Hansen, Columbia University Earth Institute, based on Hansen et al., 2012 (and discussion)

Graph 2: From “Here’s Where Global Heat Records Stand So Far in July”



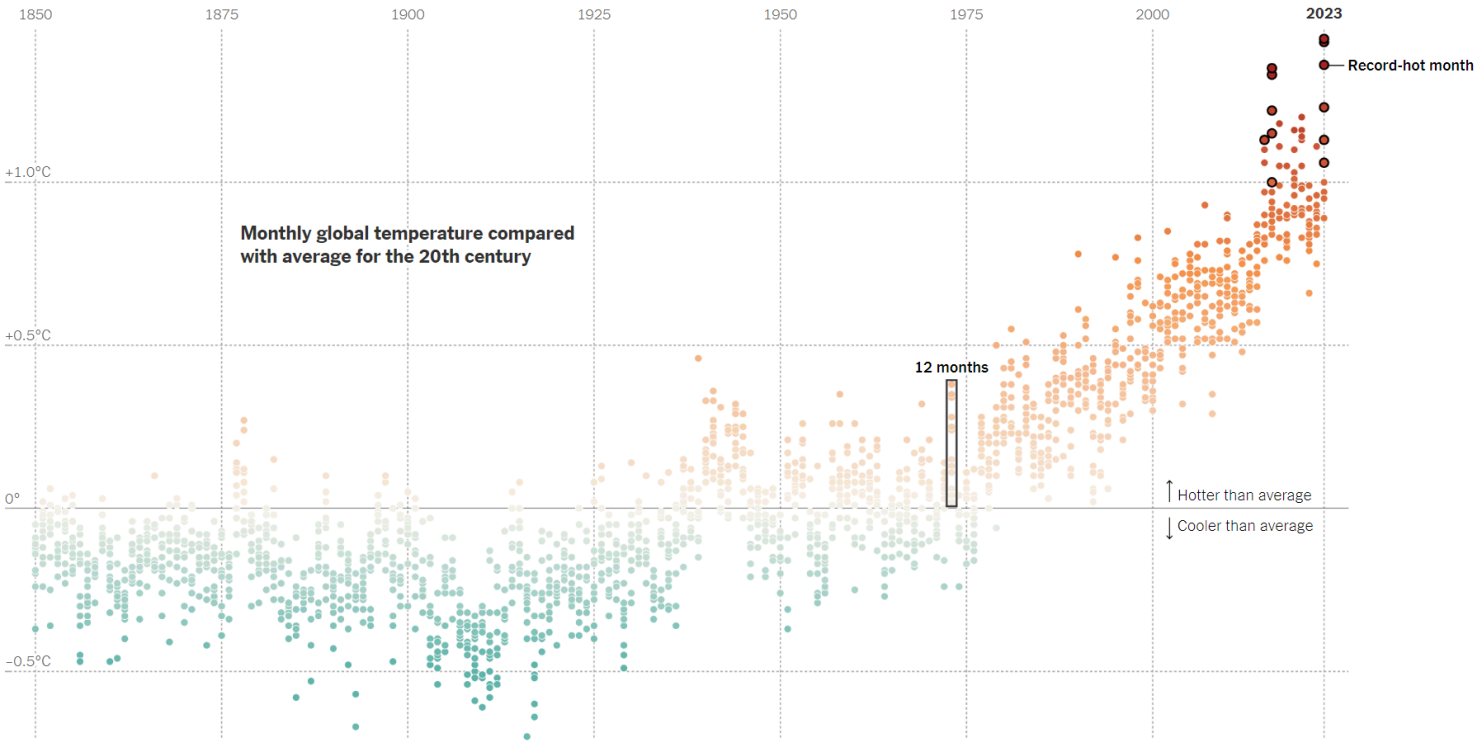
Source: Climate Reanalyzer, Climate Change Institute at the University of Maine, based on data from the National Centers for Environmental Prediction Climate Forecast System

Graph 3: From “Why We’re Experiencing So Many Unusually Hot Summer Nights”



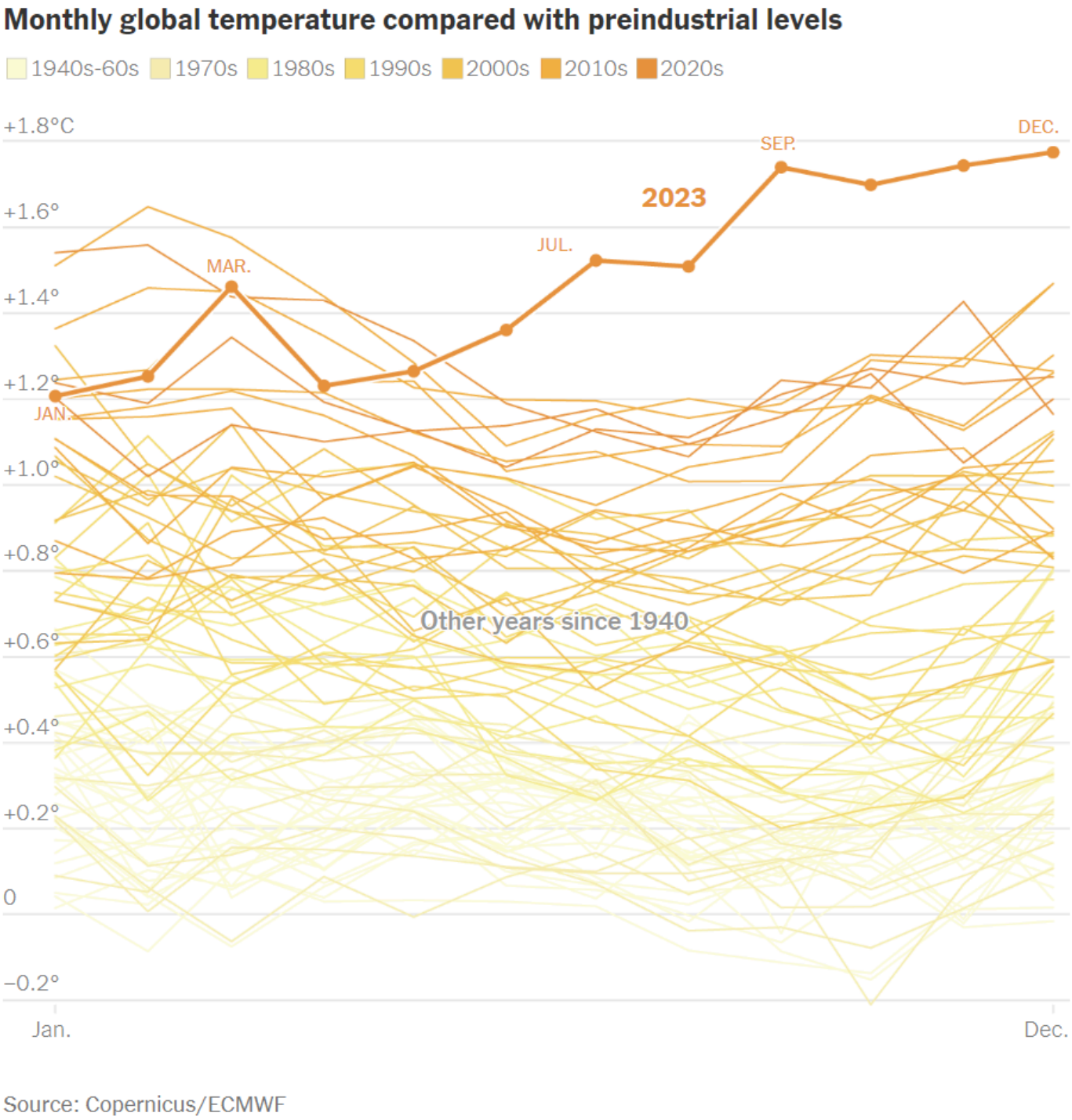
Notes:
— Distributions show daily minimum temperatures for the summer months (June – August) in each decade at airport weather stations.
— Nights are considered abnormally cold or hot based on the 5th and 95th percentile of the 1960s temperatures.
— Temperature ranges for each chart are scaled to the summer nighttime temperature ranges for each city.

Graph 4: From “Earth Was Due for Another Year of Record Warmth. But This Warm?”

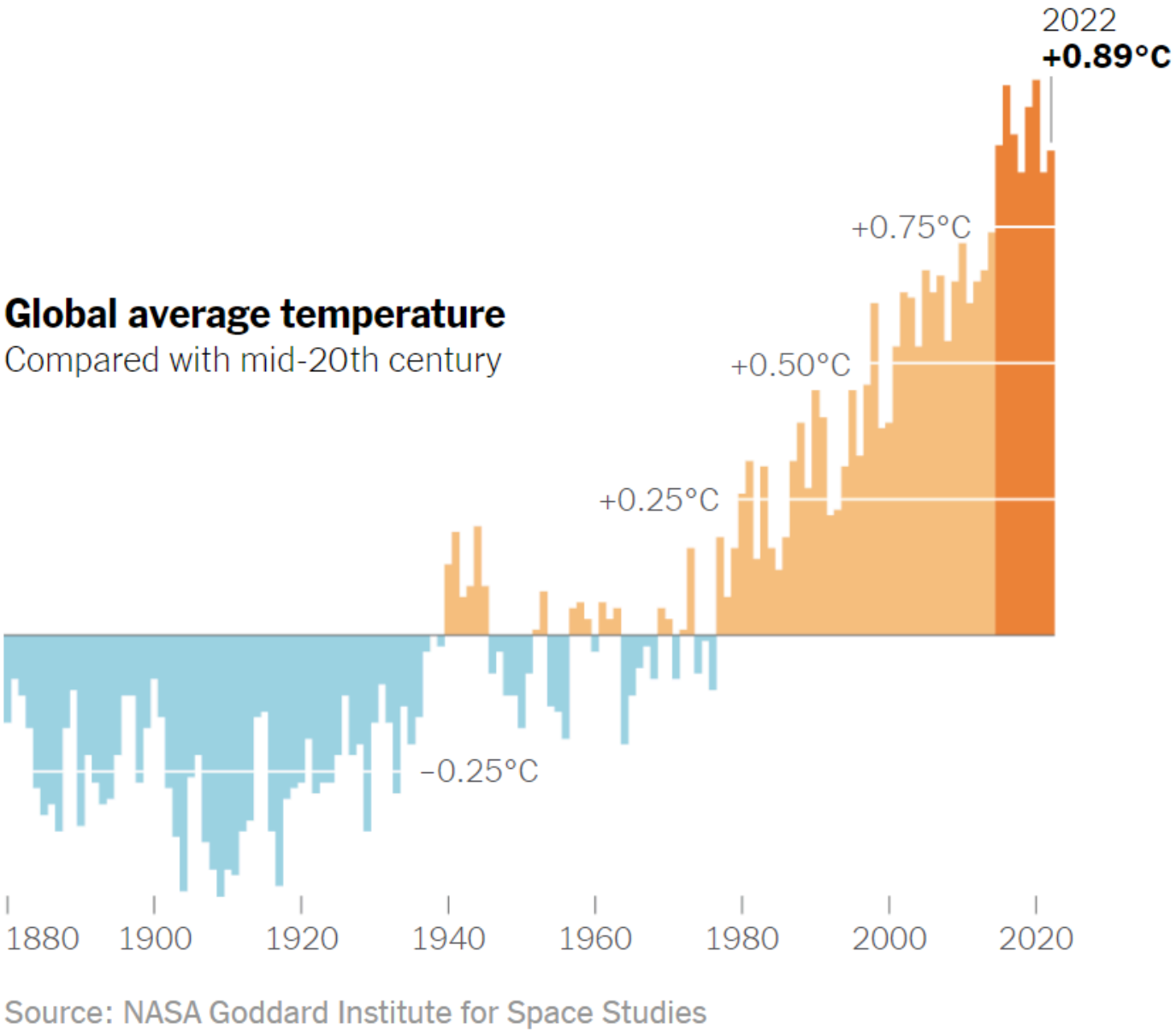


Source: NOAA • Note: Monthly temperature anomalies for global land and ocean are relative to 1901-2000 averages. Data available through November 2023. • By Nadja Popovich

Graph 5: From “A New Era in Global Heat”



Graph 6: From "The Last 8 Years Were the Hottest on Record"



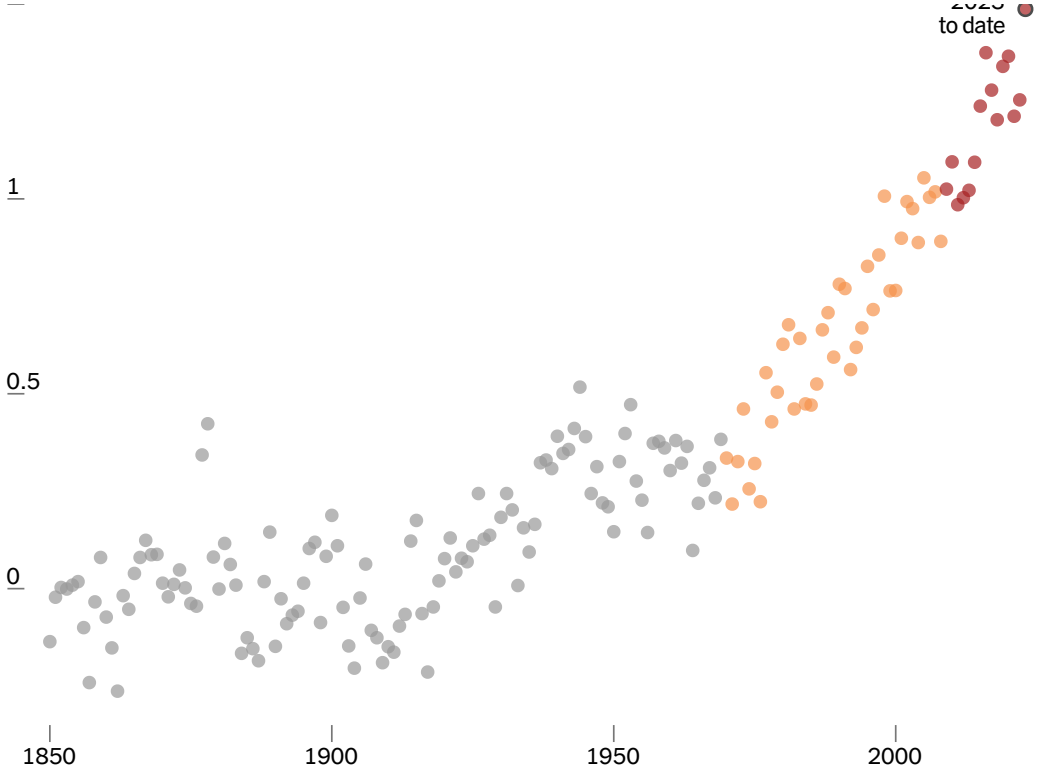
Graph 7: From "Opinion | I Study Climate Change. The Data Is Telling Us Something New."

Global warming may have accelerated in the past 15 years

Annual average temperatures since 1850

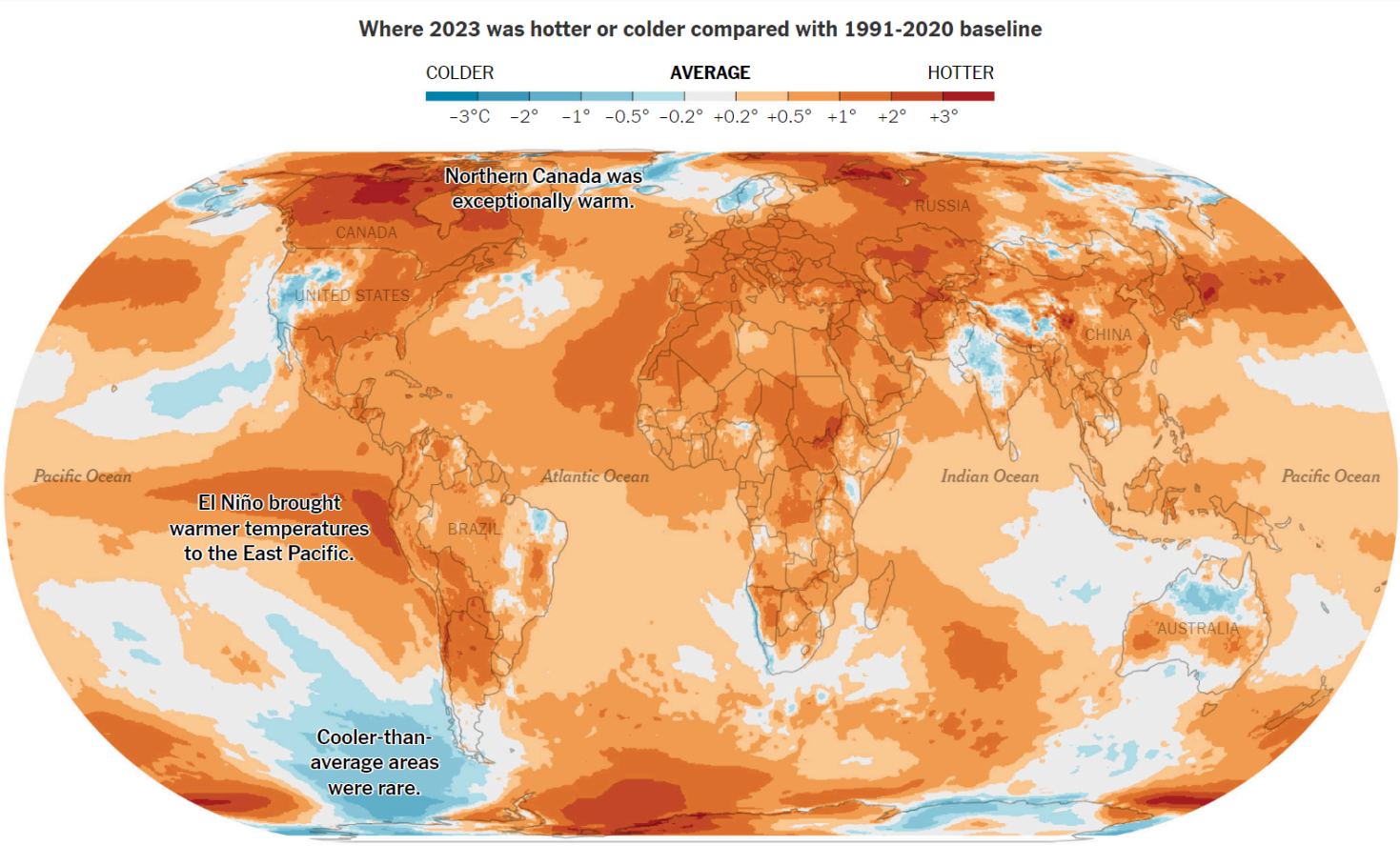
1.5°C above preindustrial levels

2023



Source: Berkeley Earth Land/Ocean Temperature Record

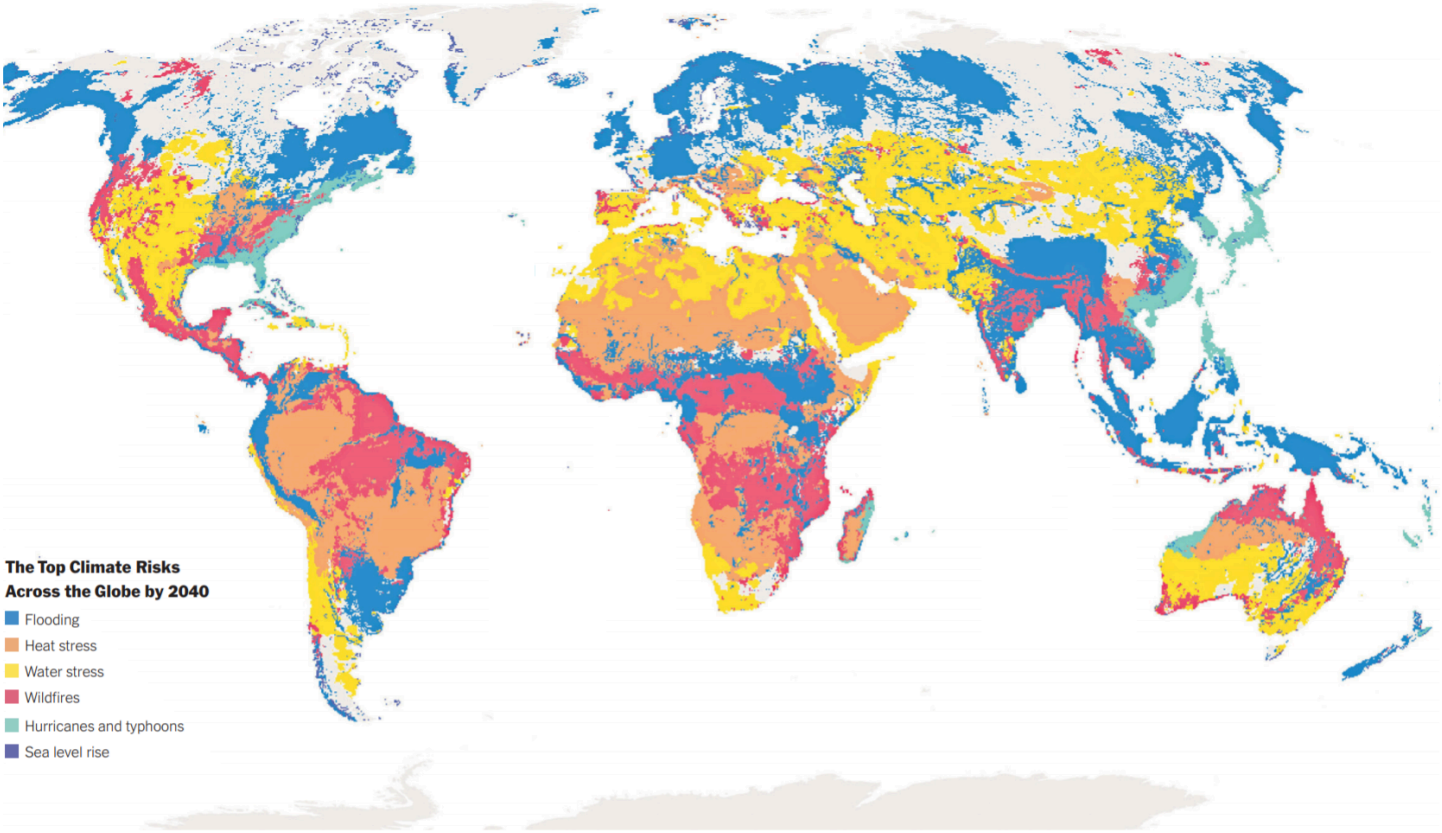
Graph 8: From “See How 2023 Shattered Records to Become the Hottest Year”



Source: Copernicus/ECMWF

Intensifying Storms and Changing Precipitation

Graph 9: From "Every Country Has Its Own Climate Risks. What's Yours?"



Source: Four Twenty Seven and The New York Times

Graph 10: From "Every Place Has Its Own Climate Risk. What Is It Where You Live?"

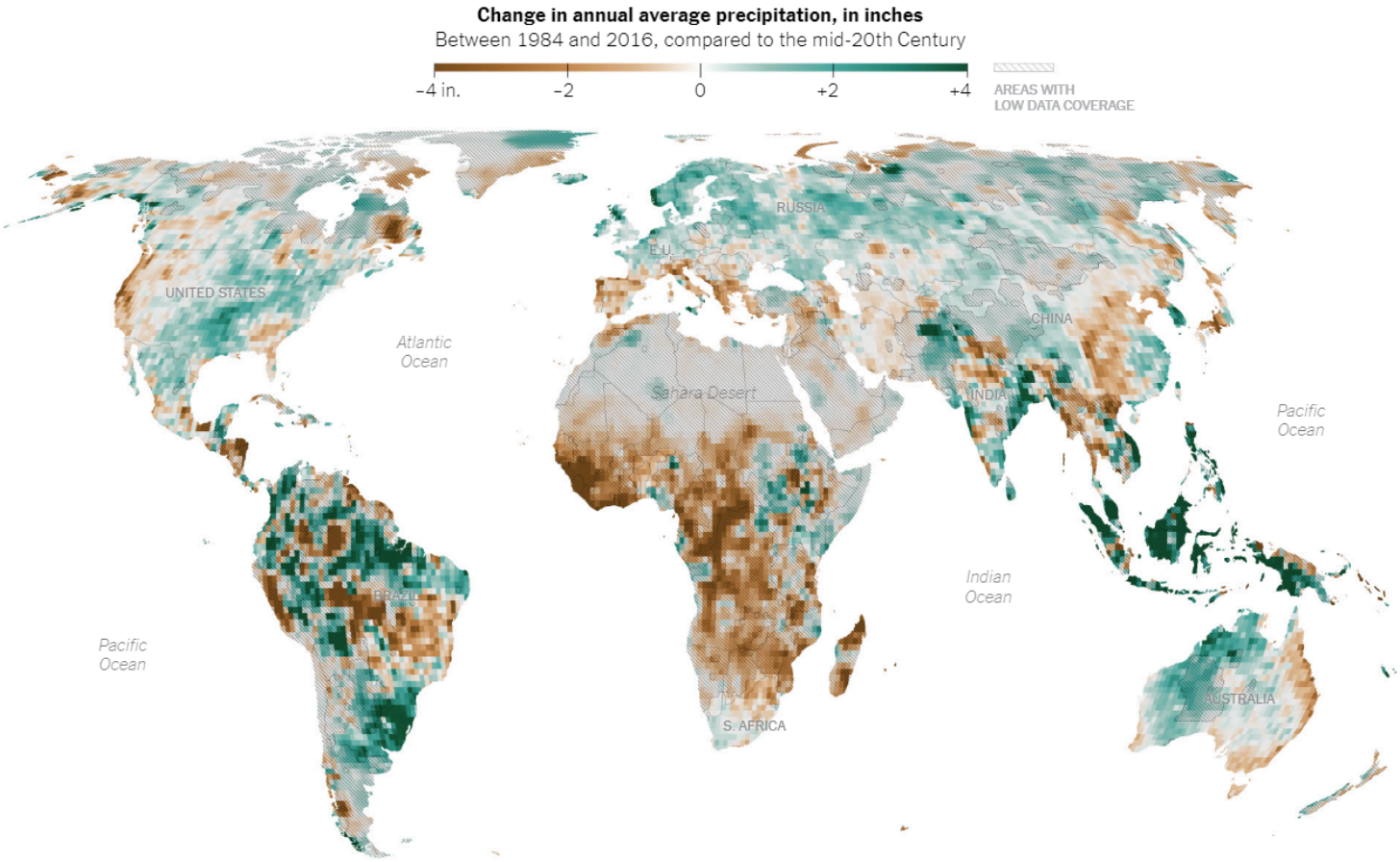
Search for your county

What to call climate change where you live

Intensity shows risk level from low (lighter) to very high (darker)

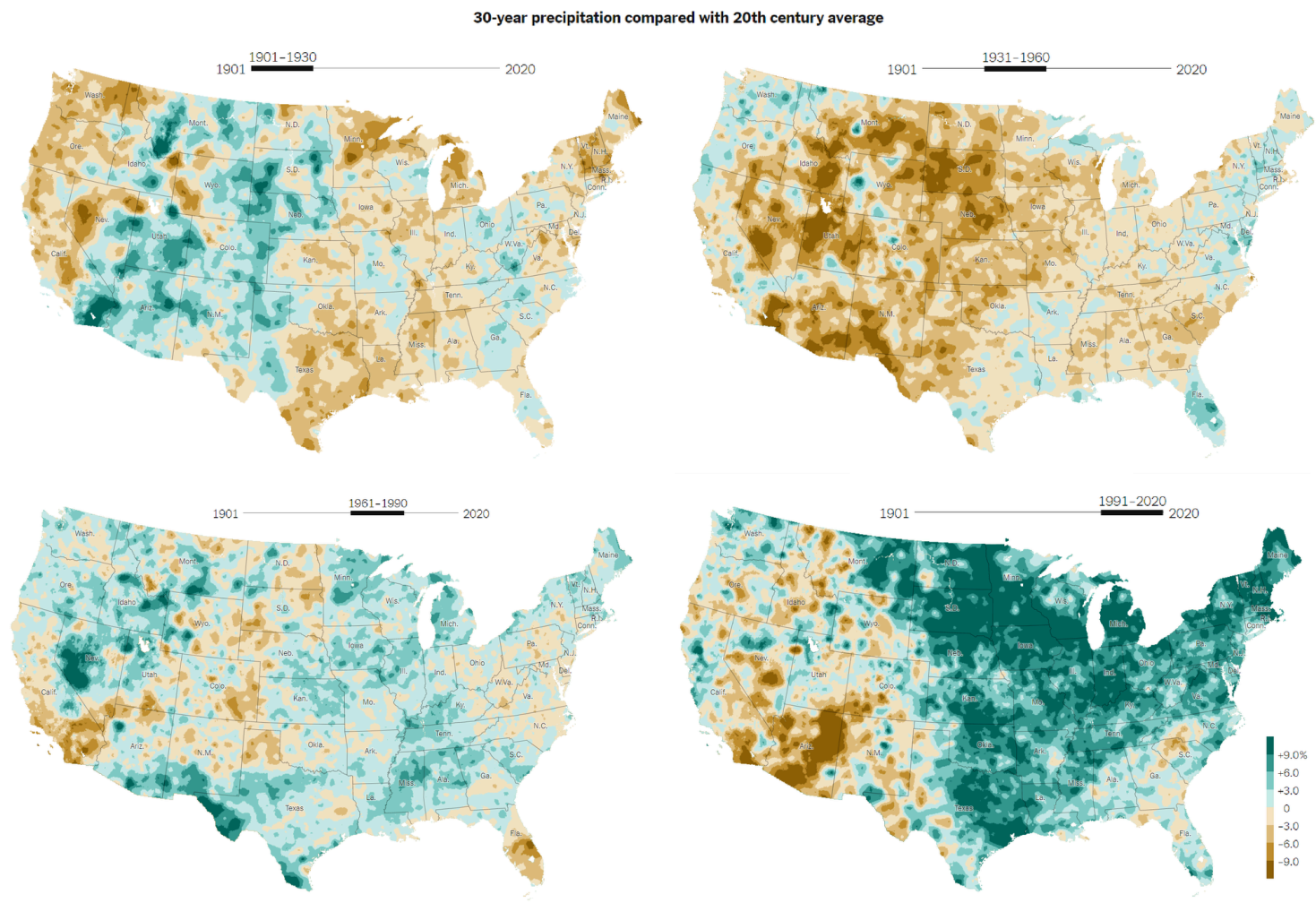
Note: “Water stress” reflects the change in drought-like conditions as well as water demand. The methodology does not consider distant water supply, so in counties where that may play a larger role, we have selected the second-highest climate risk. Risk levels reflect climate impacts from today to 2040. The “wildfire” label applies to counties where at least part of the region contains the highest risk rating in Four Twenty Seven’s data. Other terms are assigned using the highest percentile scores among the remaining climate risks. ▪ Source: Four Twenty Seven

Graph 11: From “These Maps Tell the Story of Two Americas: One Parched, One Soaked”



Source: Contractor et al., Journal of Climate • Note: Equatorial regions show a larger change due to their higher average rainfall.

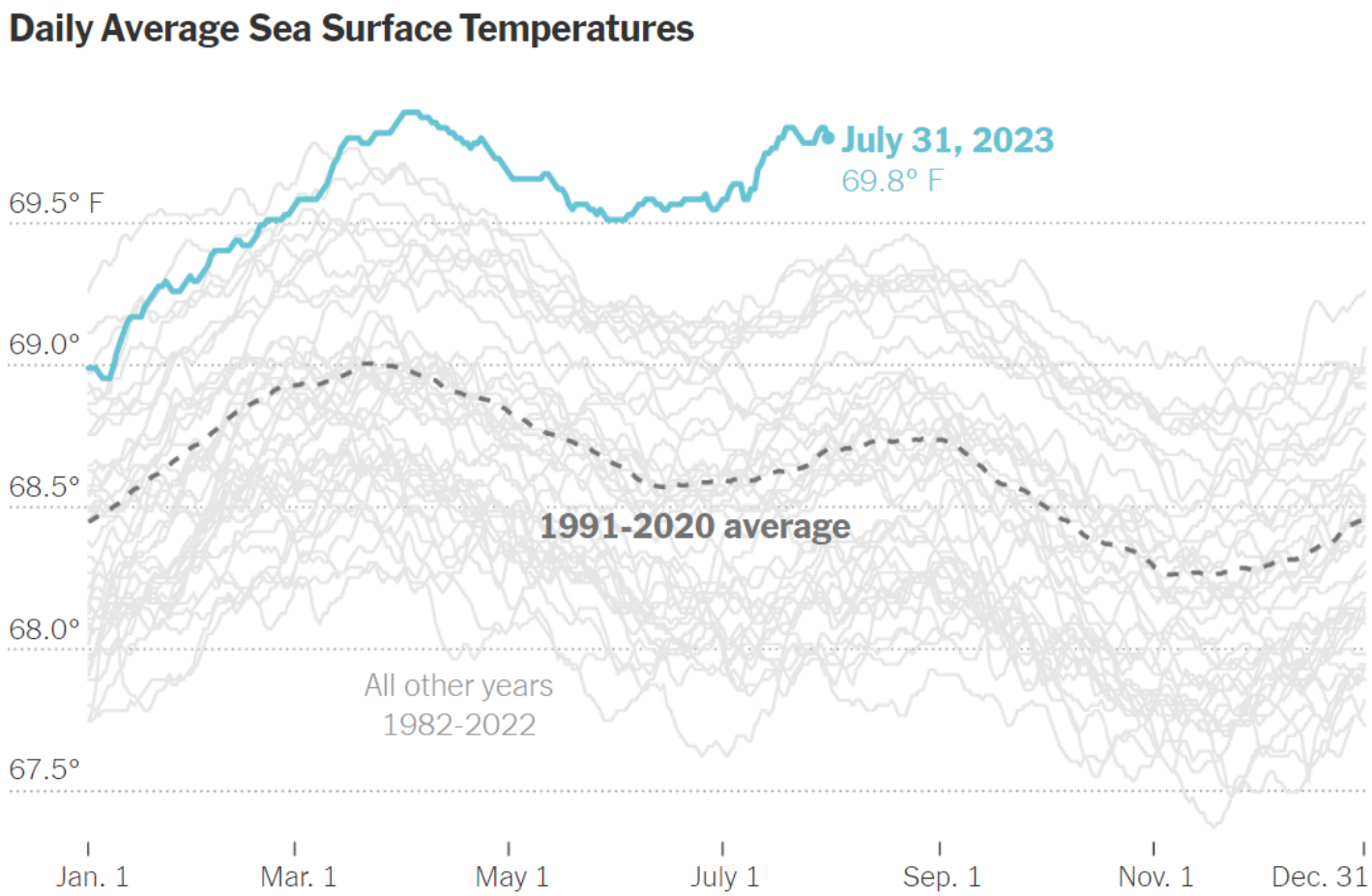
Graph 12: From "These Maps Tell the Story of Two Americas: One Parched, One Soaked"



Note: Data not available for Alaska and Hawaii. Source: NOAA's National Centers for Environmental Information

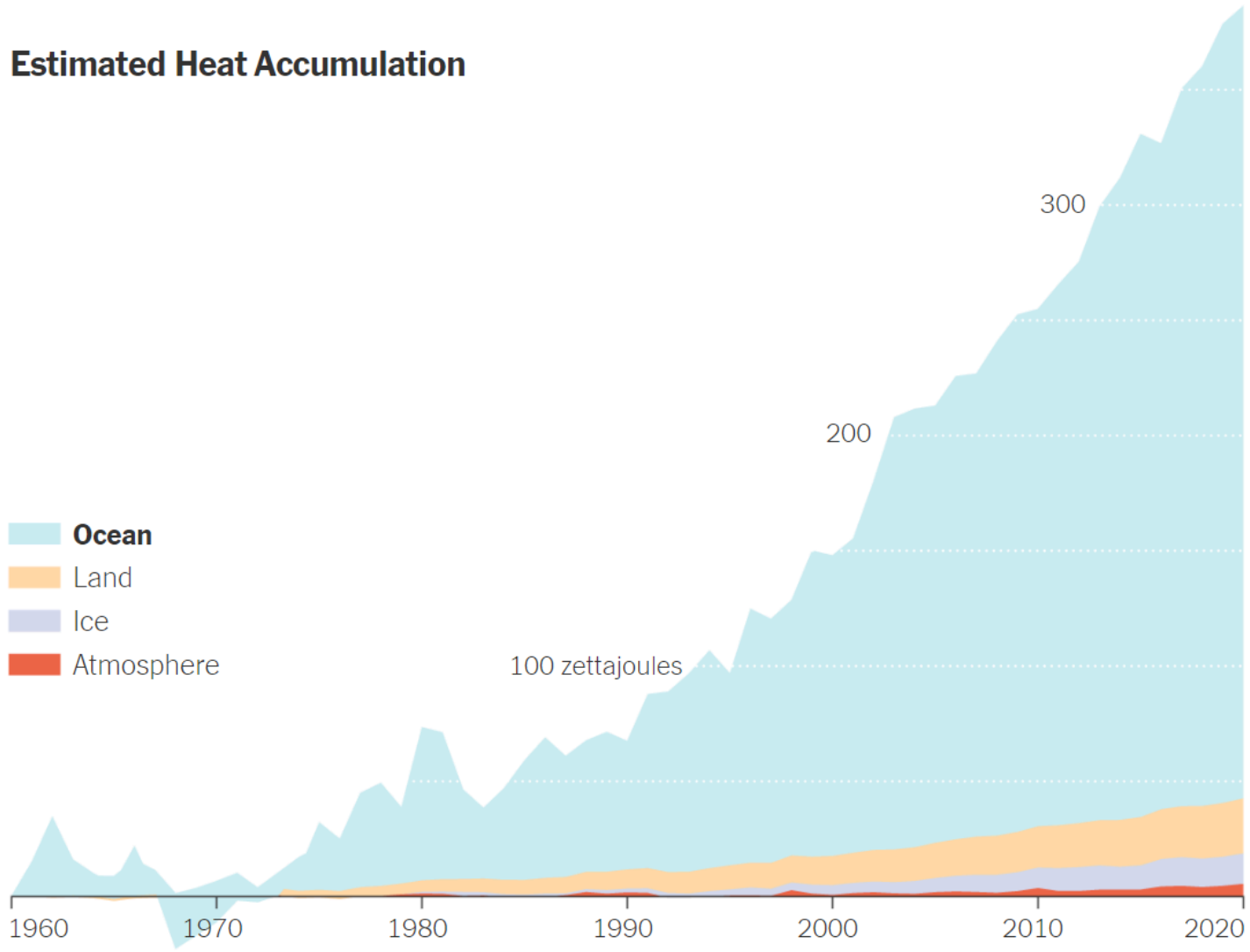
Warming Oceans

Graph 13: From "What This Year's 'Astonishing' Ocean Heat Means for the Planet"

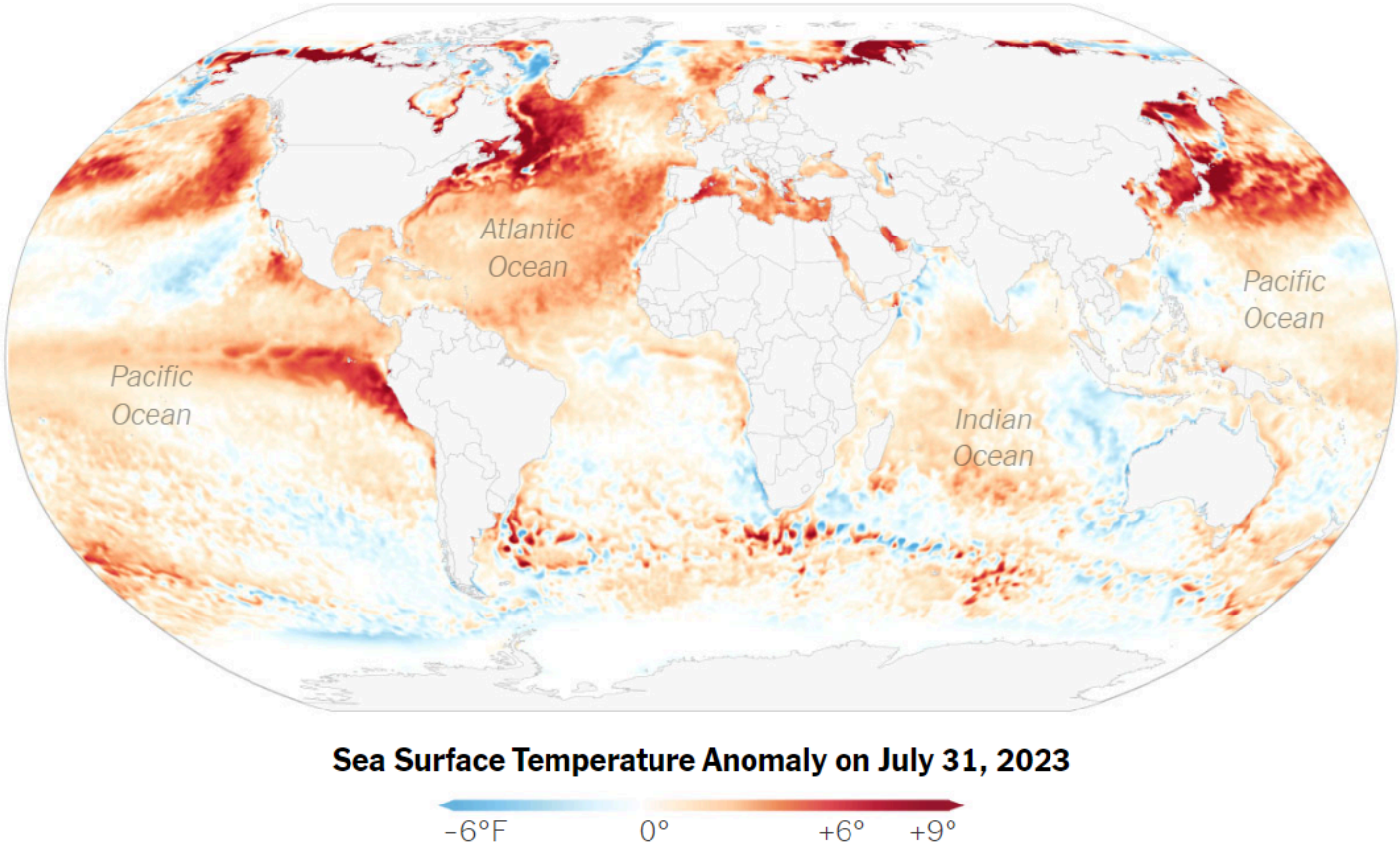


Source: Climate Reanalyzer, Climate Change Institute at the University of Maine, based on data from NOAA Optimum Interpolation Sea Surface Temperature (OISST) · Note: Average sea surface temperatures for ocean areas between 60 degrees north and 60 degrees south latitude are shown.

Graph 14: From "What This Year's 'Astonishing' Ocean Heat Means for the Planet"

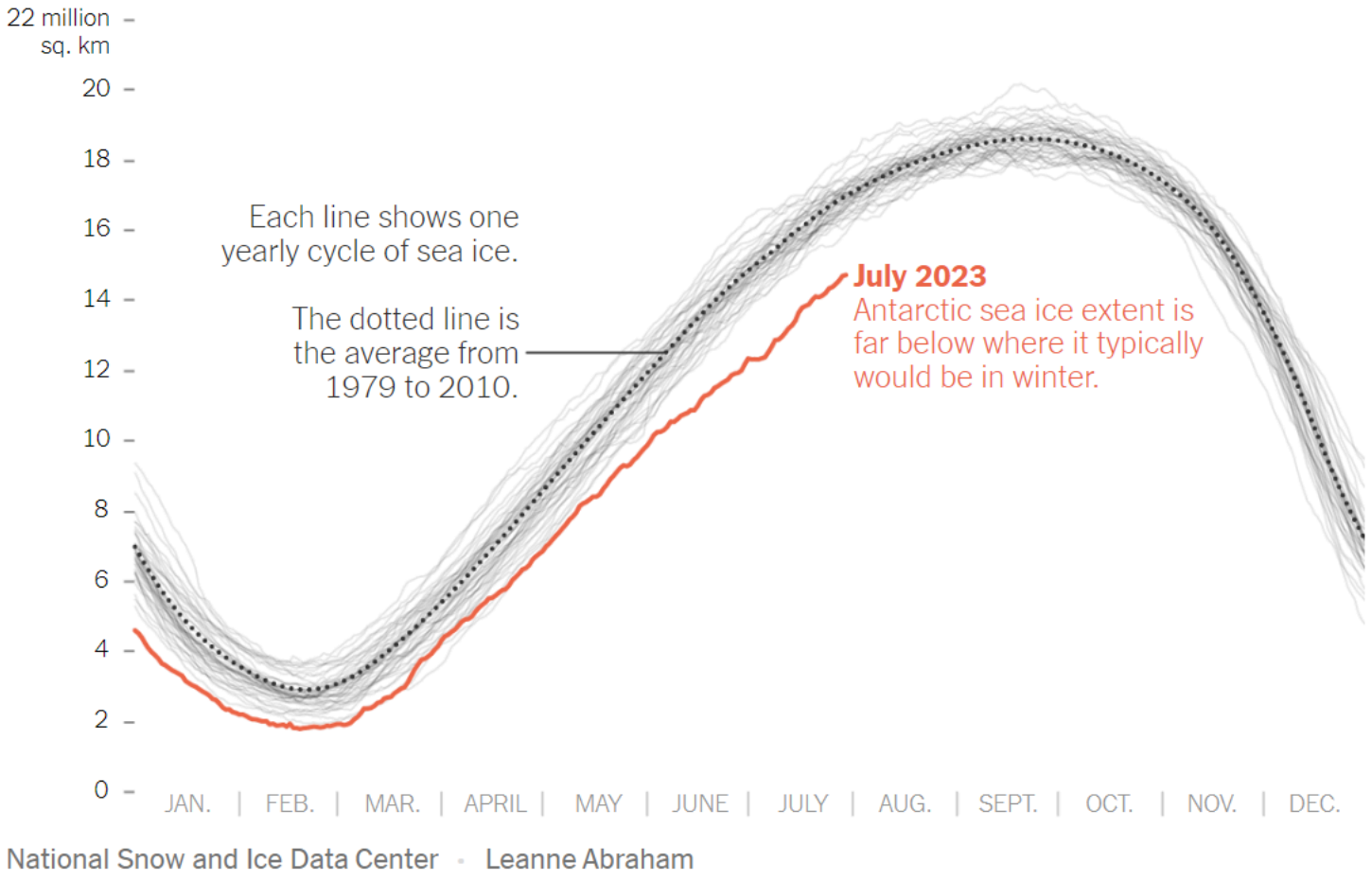


Graph 15: From "What This Year's 'Astonishing' Ocean Heat Means for the Planet"

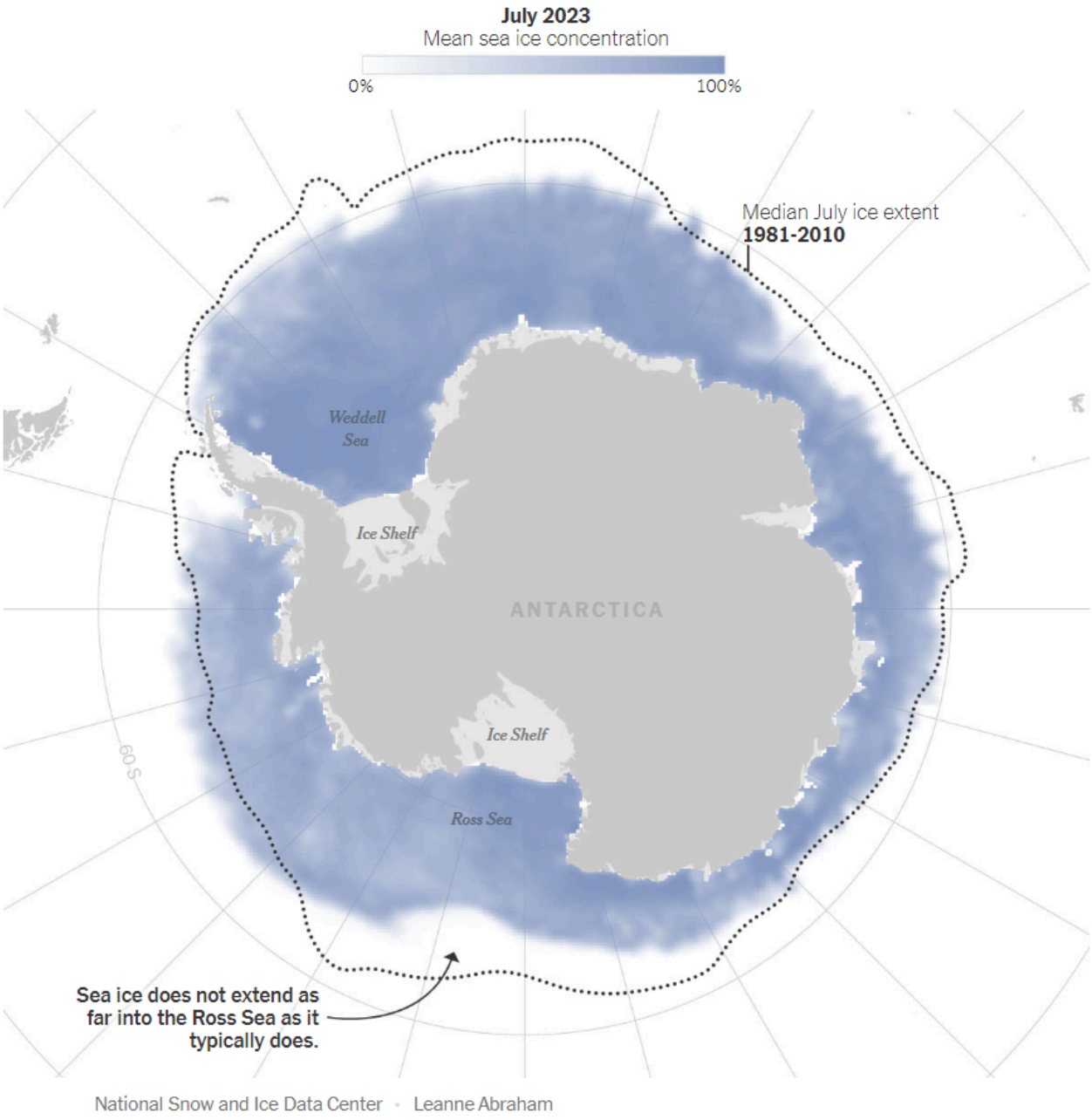


Source for the top map: NOAA Optimum Interpolation Sea Surface Temperature (OISST) | Note: Temperature anomalies in the map are calculated using a 1971-2000 baseline.

Graph 16: From "Where's All the Antarctic Sea Ice? Annual Peak Is the Lowest Ever Recorded."

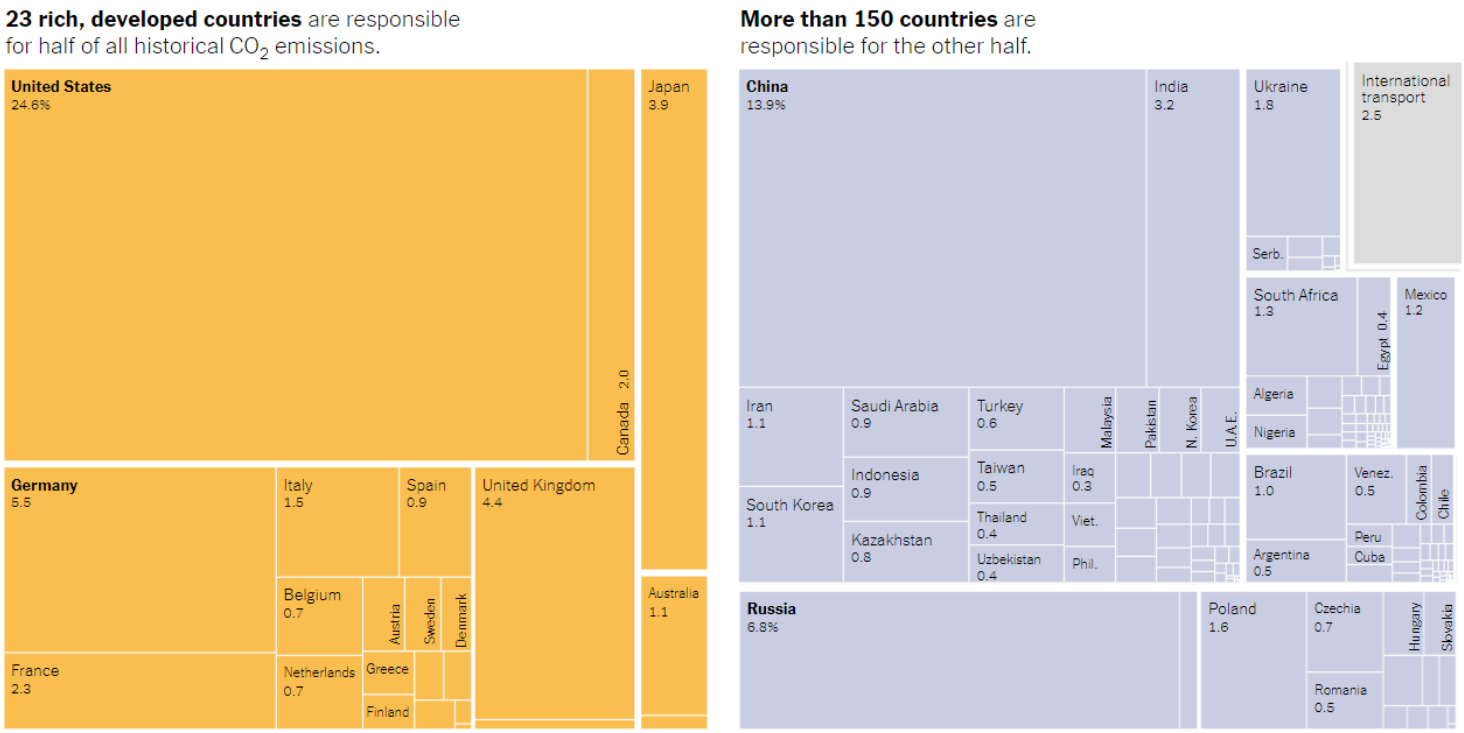


Graph 17: From "Antarctic Sea Ice Is at a 'Very Concerning' Record Low"



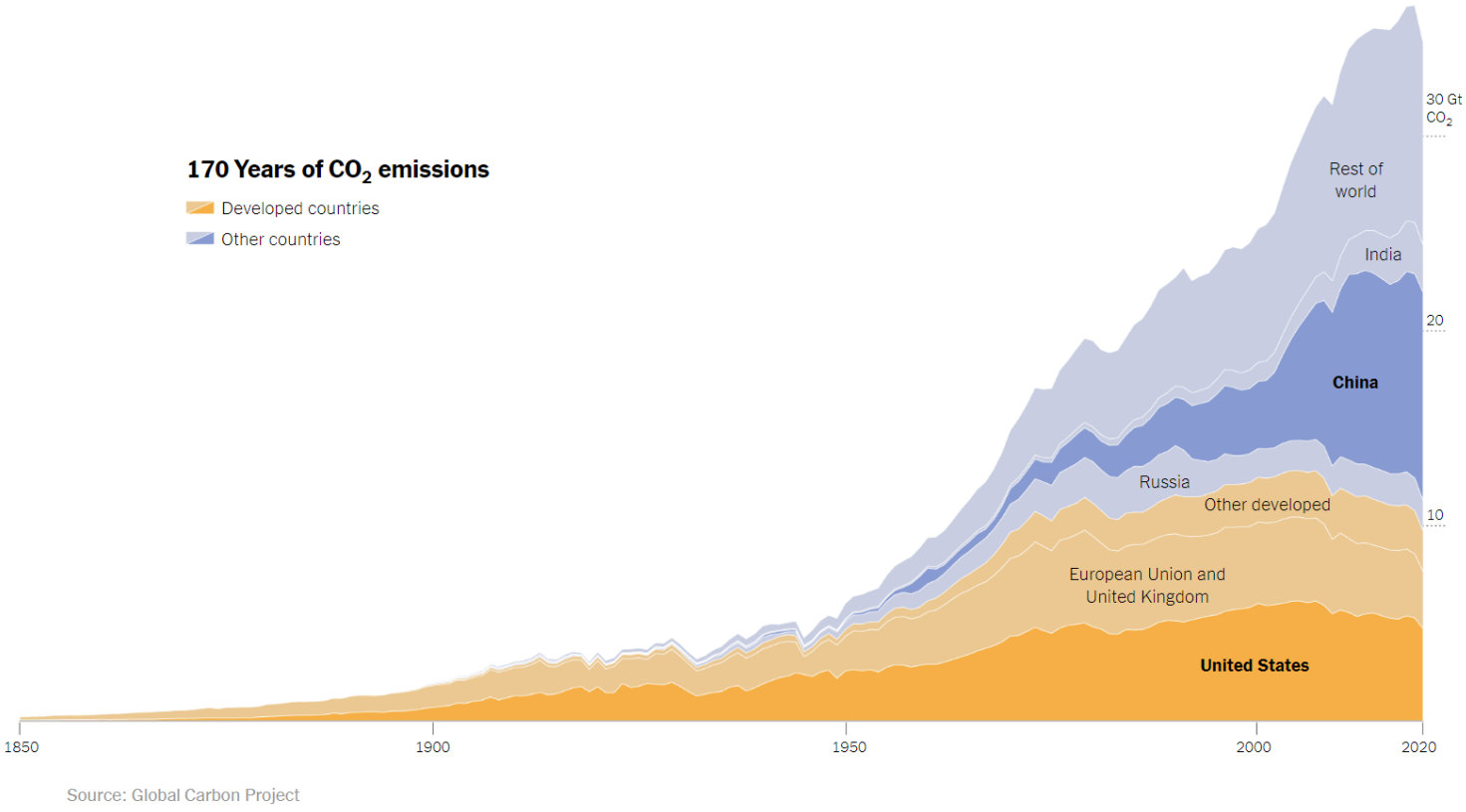
Greenhouse Gas Emissions

Graph 18: From "Who Has the Most Historical Responsibility for Climate Change?"



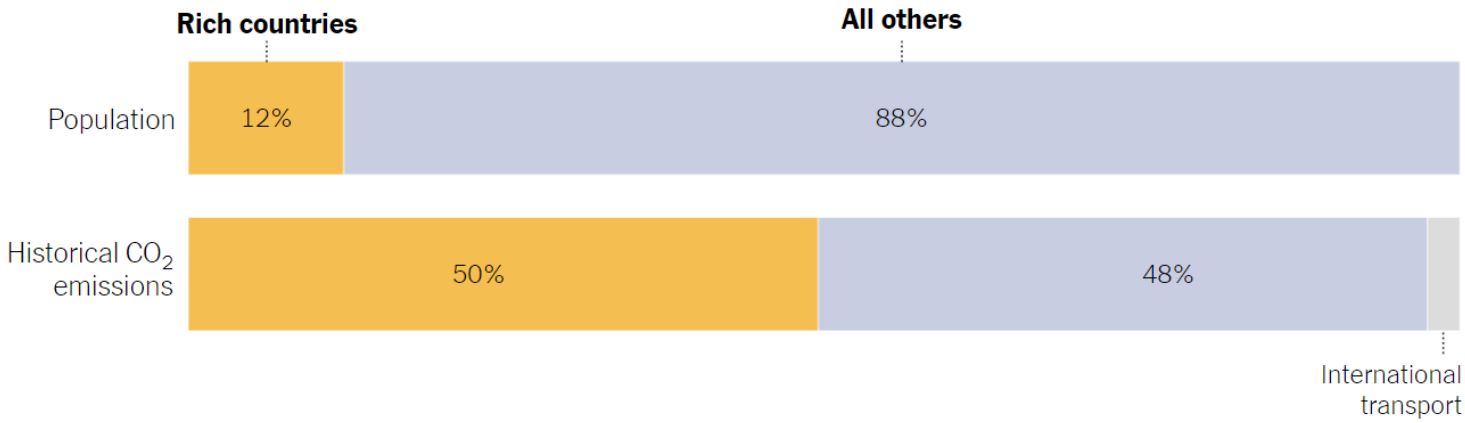
Source: Global Carbon Project, World Bank
Note: The rich, developed countries group is based on the United Nations' Annex II definition. International transport is not counted as part of either group's total emissions. The data reflects territory-based carbon dioxide emissions from fossil fuels and cement, but does not include land-use and forestry. The graphic shows emissions from countries and territories. Population data from 2020.

Graph 19: From "Who Has the Most Historical Responsibility for Climate Change?"



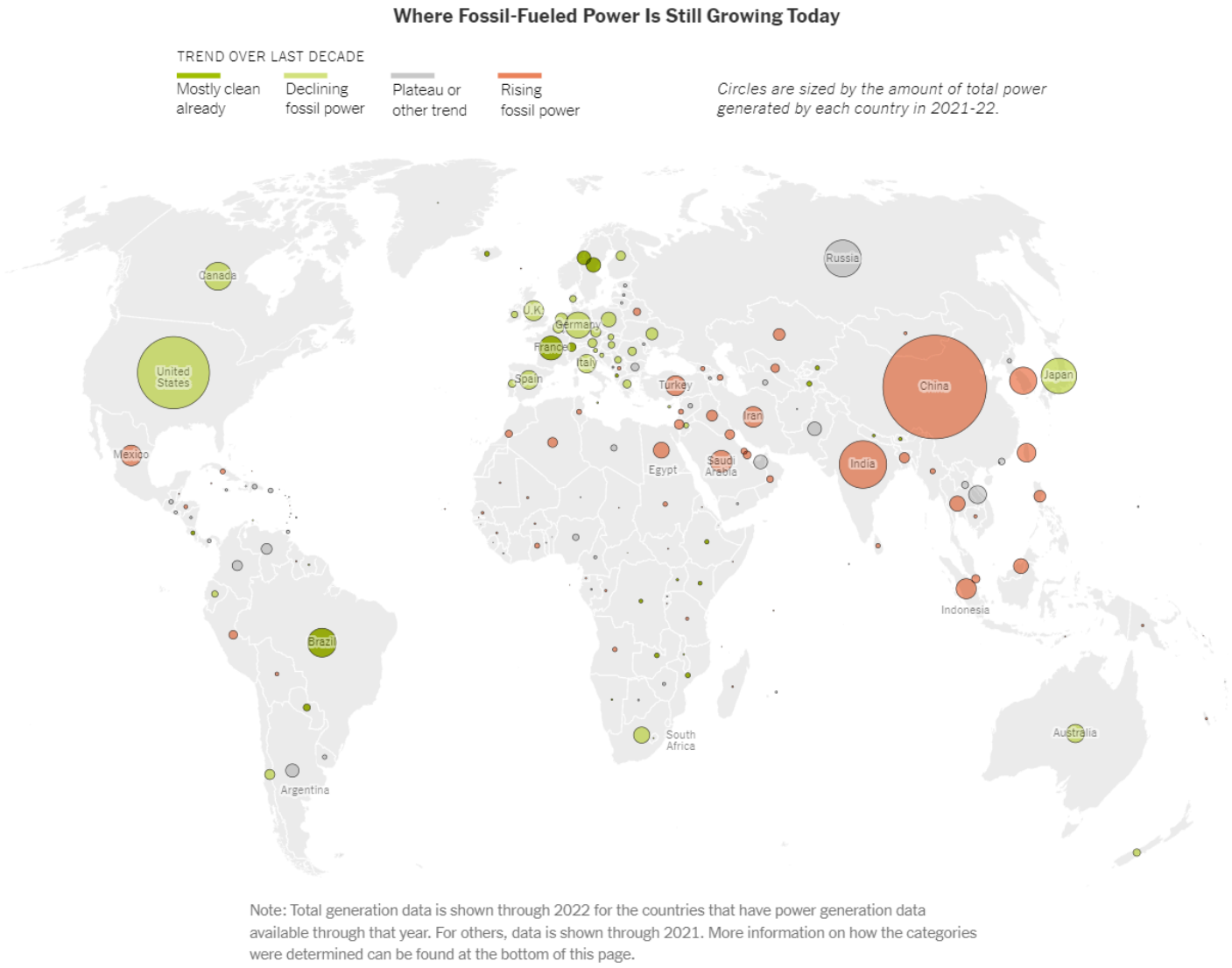
Source: Global Carbon Project

Graph 20: From “Who Has the Most Historical Responsibility for Climate Change?”

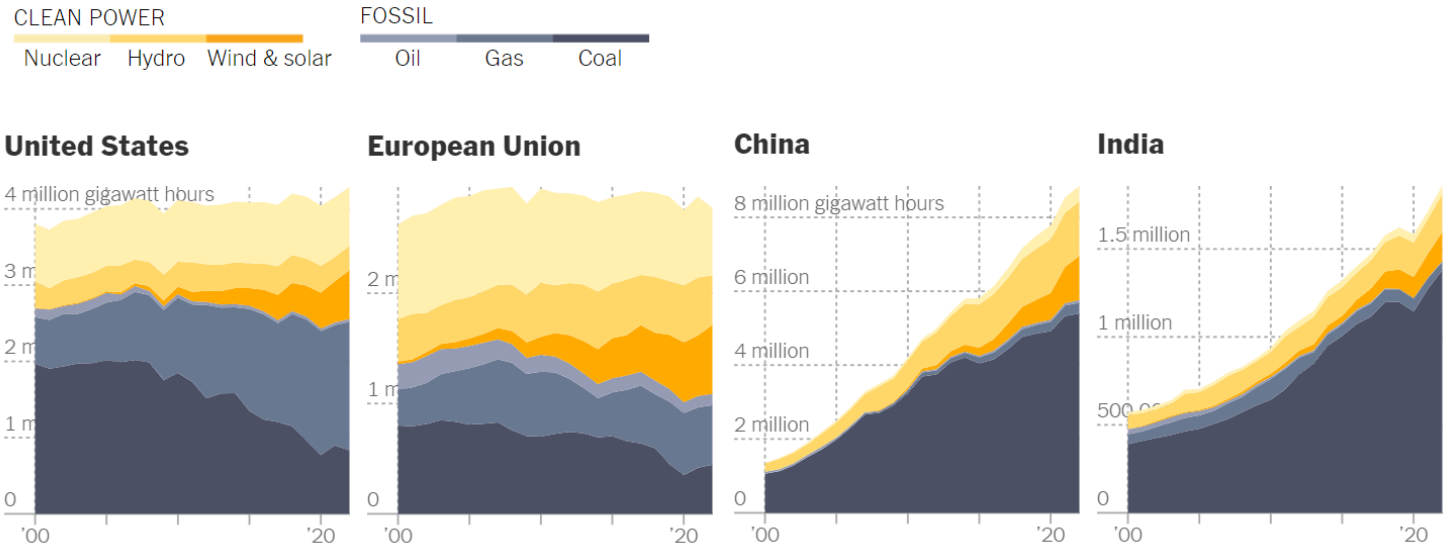


Note: Population data from 2020. Source: World Bank, Global Carbon Project

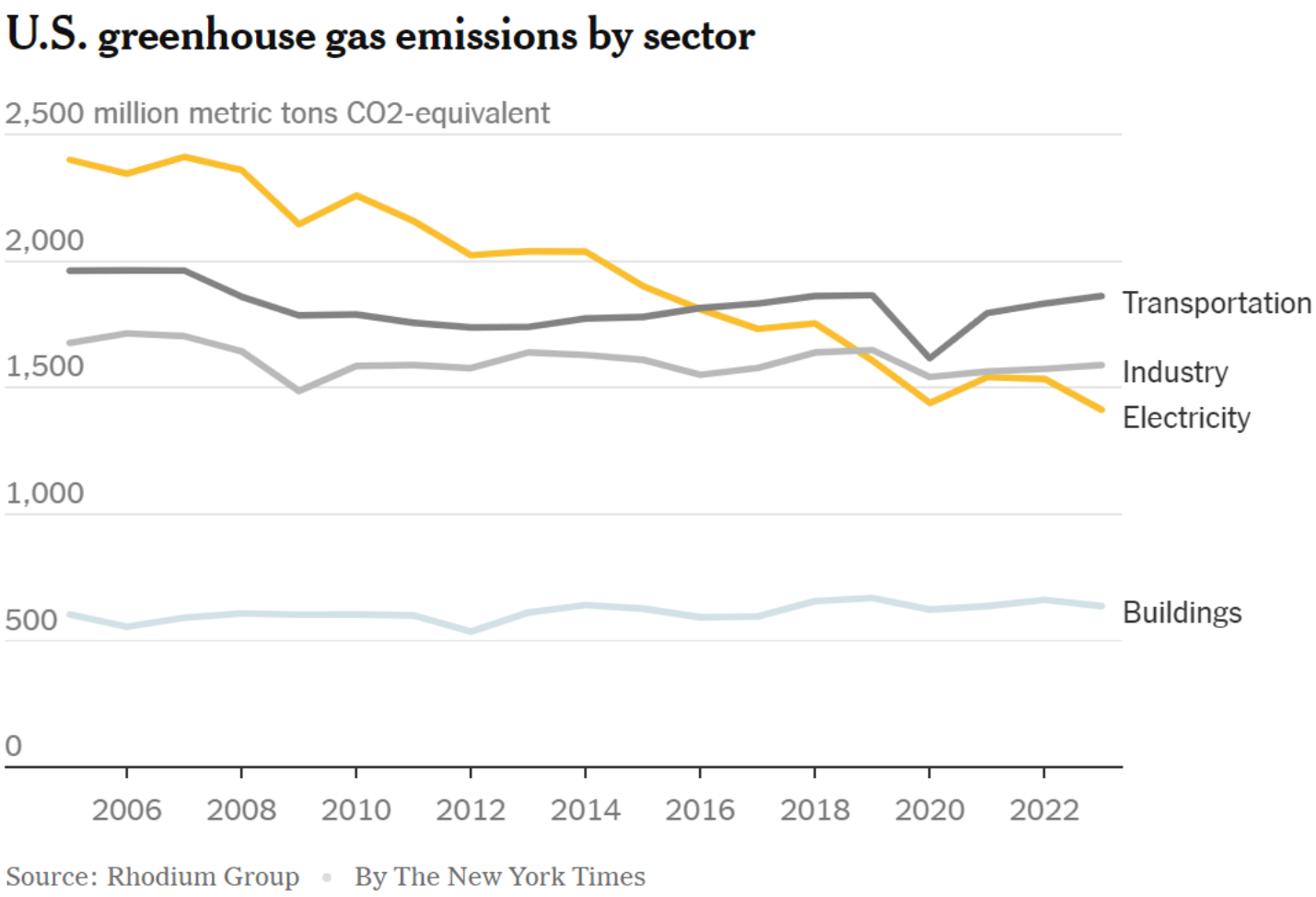
Graph 21: From “How Electricity Is Changing, Country by Country”



Graph 22: From "How Electricity Is Changing, Country by Country"

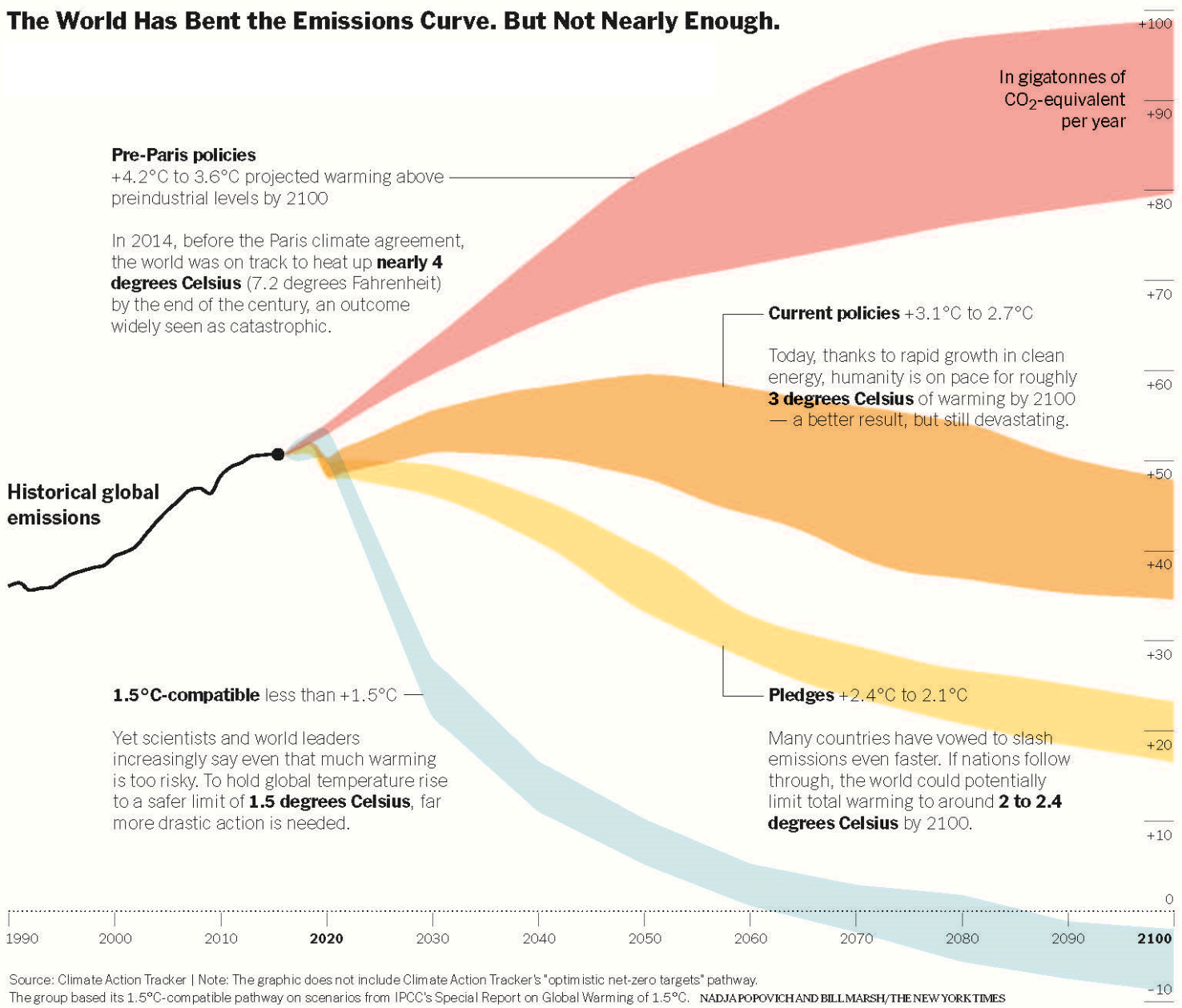


Graph 23: From "U.S. Carbon Emissions Fell in 2023 as Coal Use Tumbled to New Lows"

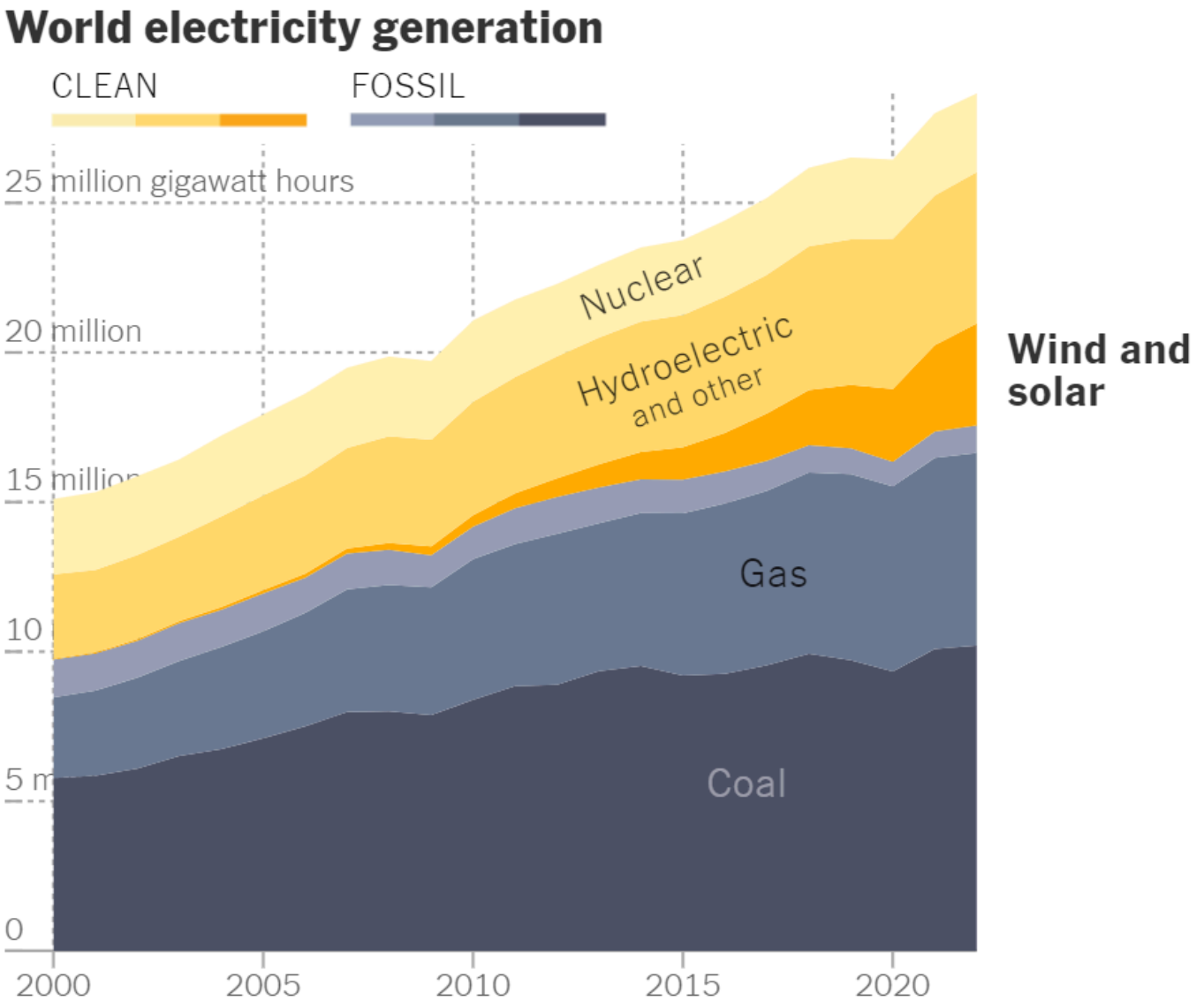


Climate Solutions

Graph 24: From "Yes, There Has Been Progress on Climate. No, It's Not Nearly Enough."

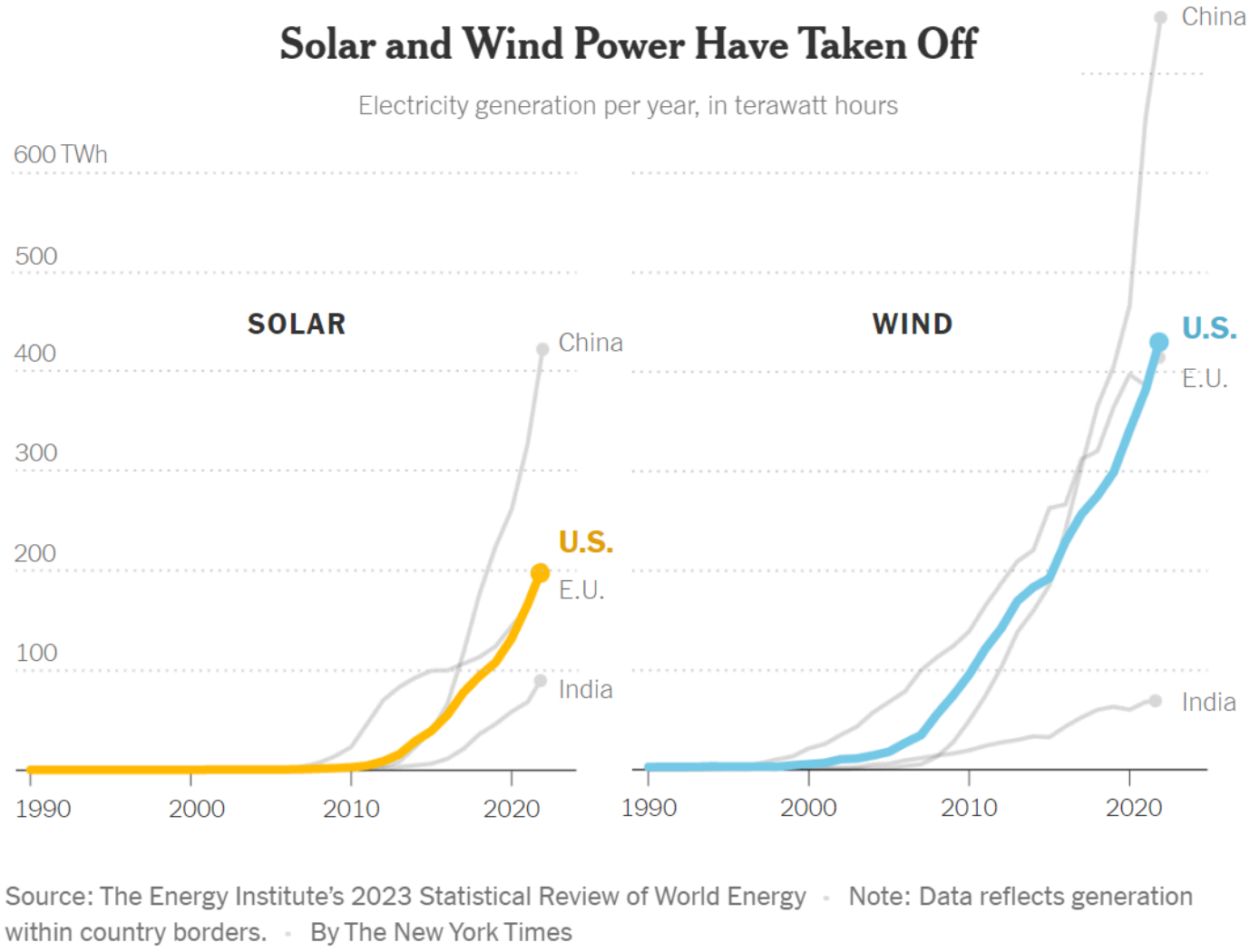


Graph 25: From "How Electricity Is Changing, Country by Country"

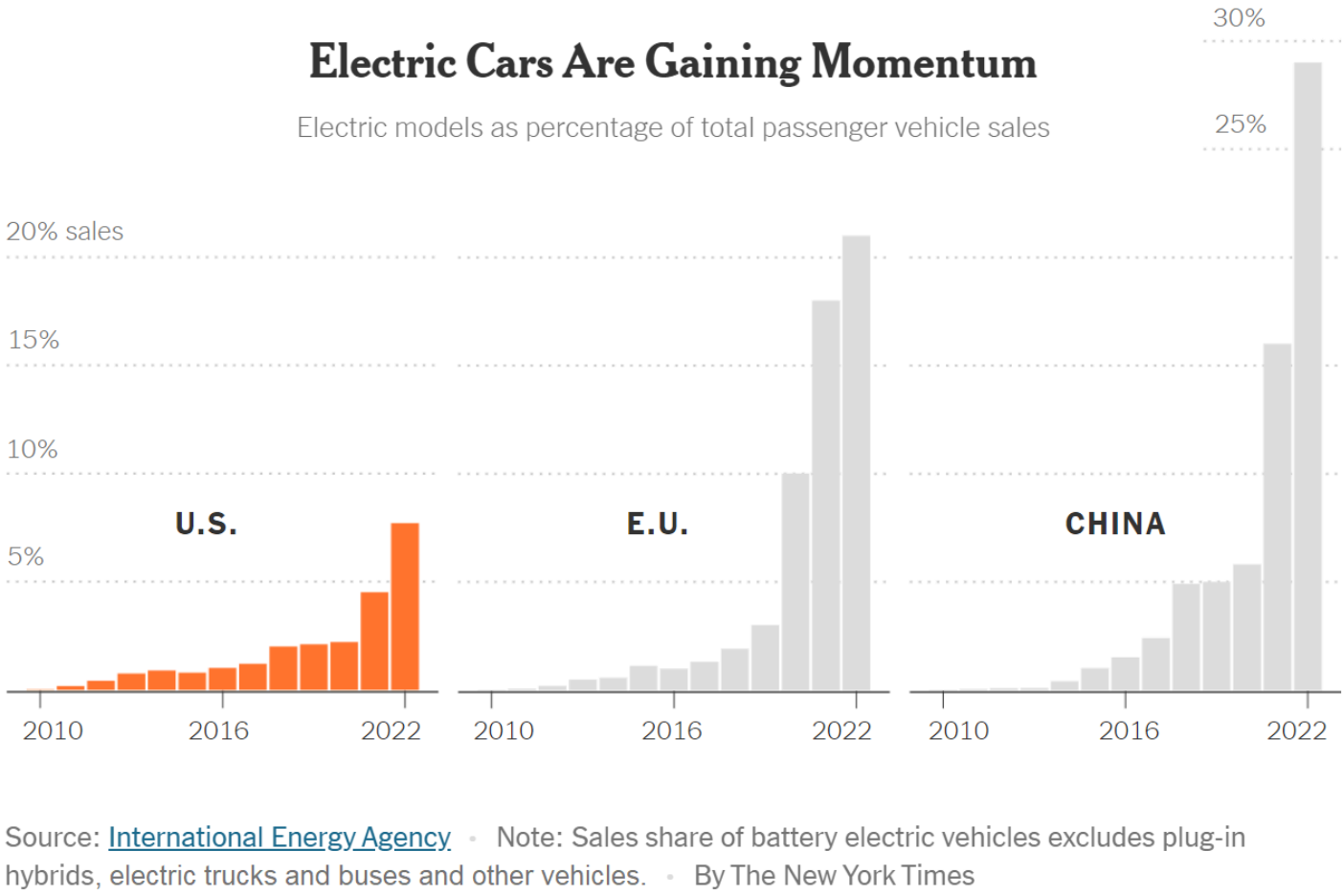


Source: Ember (Sandbag Climate Campaign CIC)

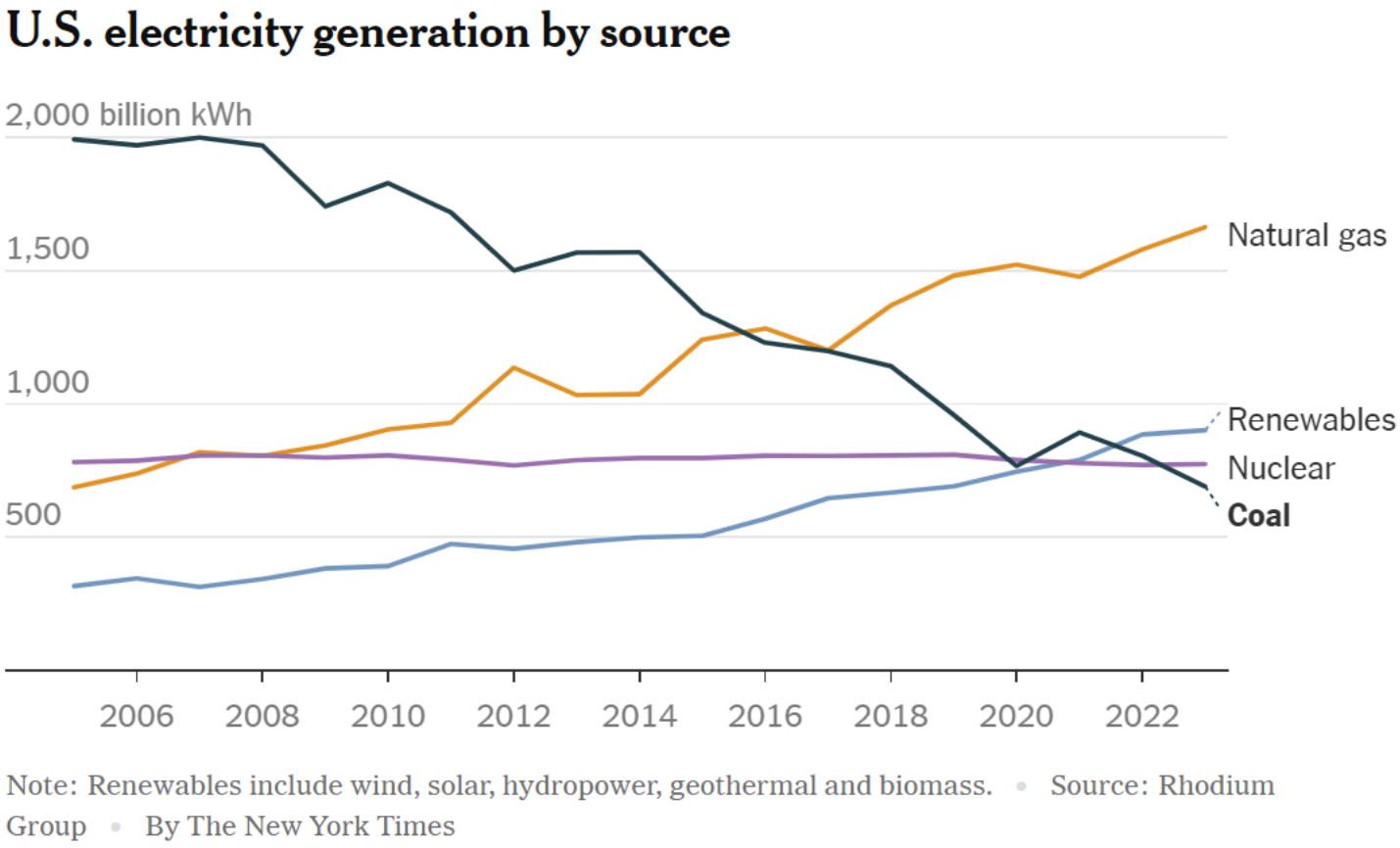
Graph 26: From "The Clean Energy Future Is Arriving Faster Than You Think"



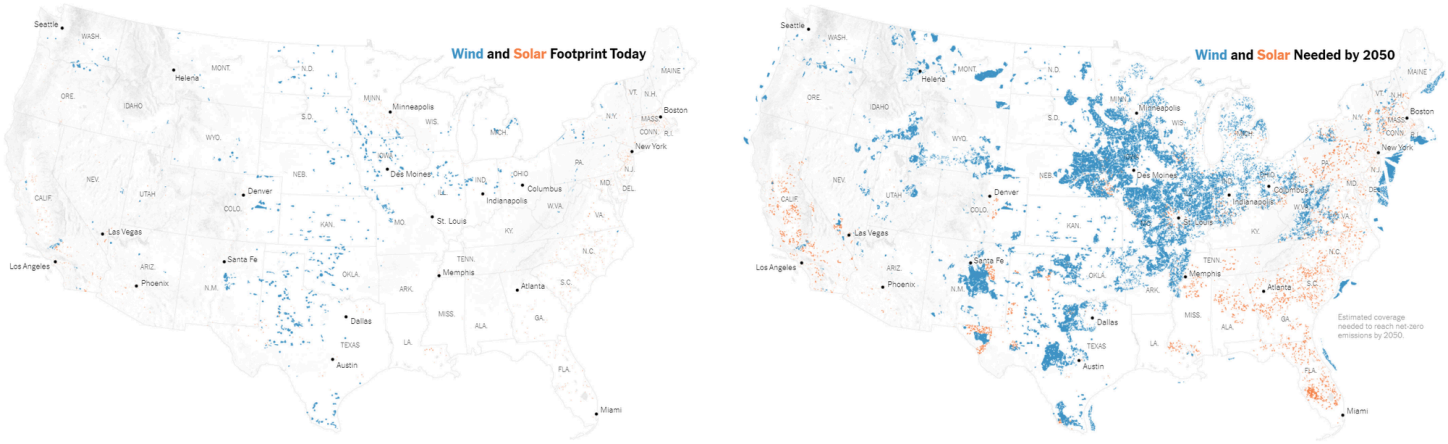
Graph 27: From "The Clean Energy Future Is Arriving Faster Than You Think"



Graph 28: From "U.S. Carbon Emissions Fell in 2023 as Coal Use Tumbled to New Lows"

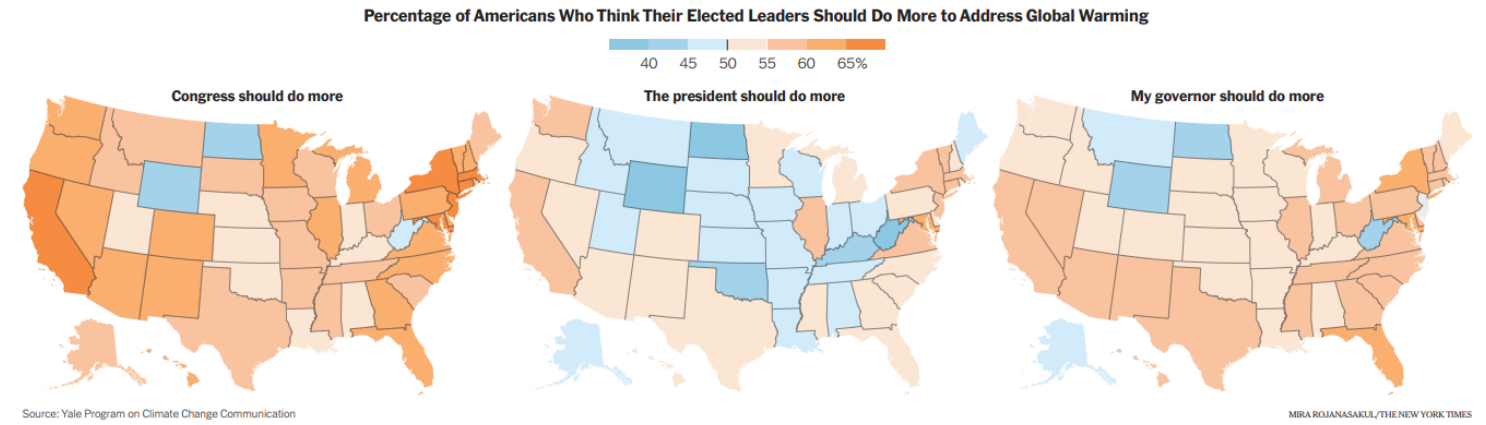


Graph 29: From "Where Wind and Solar Power Need to Grow for America to Meet Its Goals"



Source: The Princeton Net-Zero America Study | By: Veronica Penney/The New York Times

Graph 30: From "Which Elected Leaders Should Do More on Climate? What Americans Say, in Four Maps."



Strategies for Teaching With This Collection

1. Notice and wonder.

For more than seven years we have been collaborating with the American Statistical Association to bring New York Times graphs into classrooms via our What's Going On in This Graph? activity. Each week we post a new graph and then invite students to respond to four open-ended prompts:

- What do you notice?
- What do you wonder?
- How does this relate to you and your community?
- Create a catchy headline that captures the graph's main idea.

Teachers can use this same activity with one or more graphs from this collection. Students can journal individually or share their observations with a partner before moving into a class discussion. Or, you can host the conversations online (similar to our comments section), where students post their ideas in an online classroom forum and the teacher and other students submit replies with the goal of helping one another deepen their analysis.

For more detailed information about how to use this approach, visit our previous climate change graph collection, or watch our three-minute tutorial or 45-minute webinar.

2. Read and react.

Invite students to pick any graph from the collection and click on the article link above it. Then they should read the piece and answer these questions:

- How does the article contribute to your understanding of climate change?

- What role do the graphs embedded in the article serve? Do they make it better? If you were the article's editor, would you have made the decision to include the graphs? Why, or why not?
- What other questions do you have after reading the article?

3. Investigate.

To create each of the graphs in this collection, the Times graphics team used data from one or more sources. Ask students to find the source of the data, which is labeled on the graph itself or in the article, and then investigate using the following prompts:

- Who collected this data? Why did they collect it?
- How did they collect it? What was their methodology?
- When was this data collected? Is it still current?
- Is this data accurate and reliable? How do you know?
- What do you think about the way Times editors decided to present the data visually in a graph? Do you think they made the right choices? Why, or why not?
- How else could this data be presented?

4. Rank.

There are 30 graphs in this collection. Assign students to work in pairs or small groups, and then have them discuss which graph they think is most effective for teaching the general public about Earth's changing climate. Or, have students choose a few. Then they should explain why they selected that graph — or those graphs.