

# Communicating Climate Change: Messengers, Messages, and Mechanisms

Karen Florini – Senior Advisor  
[kflorini@climatecentral.org](mailto:kflorini@climatecentral.org)


10 July 2024


# Today's talk

## Will cover:

- Free tools & resources
- Informal comms
- Non-advocacy

## Won't cover:



**The Oxford Encyclopedia of Climate Change Communication** 

Matthew C. Nisbet, Shirley S. Ho, Ezra Markowitz, Saffron O'Neill, Mike S. Schäfer, and Jagadish Thaker (eds) Reference library

Reference type: **Subject Reference**

Current Version: 2018

ISBN: 9780190498986

eISBN: 9780190498993

Subject: Science and technology, Earth Sciences and Geography, Social sciences, Environment

**Length: 1.27 million words**

Publisher: Oxford University Press

Illustration(s): 124

Over 100 entries

# POTENTIAL ENERGY

[Potentialenergycoalition.org](https://Potentialenergycoalition.org)

POTENTIAL  
ENERGY

# Later is Too Late

A comprehensive analysis of the messaging that accelerates climate action in the G20 and beyond

November 2023

[potentialenergycoalition.org/guides-and-reports/global-report](https://potentialenergycoalition.org/guides-and-reports/global-report)





To increase jobs, opportunities and economic growth



To reduce social inequality and support those impacted by climate change

**( Later is Too Late )**

**1x** To increase jobs, opportunities and economic growth

**1x** To reduce social inequality and support those impacted by climate change

**5x**  
To protect our health by reducing air and water pollution

**7x**  
To protect ourselves from extreme weather

**( Later is Too Late )**

**1x** To increase jobs, opportunities and economic growth

**1x** To reduce social inequality and support those impacted by climate change

**5x**  
To protect our health by reducing air and water pollution

**7x**  
To protect ourselves from extreme weather

**12x**  
To protect the planet for future generations

**( Later is Too Late )**

# Talk like a human

Lessons on how to  
communicate  
climate change

POTENTIAL  
ENERGY

[potentialenergycoalition.org](https://potentialenergycoalition.org)





“The data says that these two simple foundations are STILL among the most important messages:

1. Carbon pollution from fossil fuels stays in the atmosphere, causing the planet to overheat dangerously
2. There is complete scientific consensus on this fact”



- Make it local
- Tie climate change to its consequences
- Talk about making energy 100% clean rather than eliminating an industry
- Avoid wonkspeak: “Save [location]” beats “Get to Net Zero by 2040”

# Communicating Climate Change

- Messengers
- Messages
- Mechanisms

# Communicating Climate Change

- Audiences
- Messengers
- Messages
- Mechanisms
- But first...



# Why

BRIEF REPORT | ENVIRONMENTAL SCIENCES | OPEN ACCESS



# Discussing global warming leads to greater acceptance of climate science

Matthew H. Goldberg  , [Sander van der Linden](#), [Edward Maibach](#), and [Anthony Leiserowitz](#) [Authors Info & Affiliations](#)

July 8, 2019 | 116 (30) 14804-14805 | <https://doi.org/10.1073/pnas.1906589116>

 the Guardian

Truthful climate reporting shifts viewpoints, but only briefly, study finds

Ohio State University researchers gauged responses to climate science versus scepticism and suggest **facts bear repeating**

[www.pnas.org/doi/abs/10.1073/pnas.2122069119](http://www.pnas.org/doi/abs/10.1073/pnas.2122069119)

# Who

# The most important question: who

- “The general public”
  - As voters/constituents?
  - As (potential) activists?
  - As consumers?
- Climate professionals
  - Generalists
  - Specialists

# Tools re Audiences

- UN Development Program/Oxford University
- Yale University

UNITED NATIONS DEVELOPMENT PROGRAMME



# PEOPLES' CLIMATE VOTE 2024

Results

- Frequency of thinking about climate change
- Influence on family decisions



## QUESTION

How frequently do you think about climate change?

*Over half (56 percent) of people globally said they thought about climate change daily or weekly*

32% a few times a year, 11% never





- Big variation by country:
  - Uganda 62 %
  - Czech Republic 16%
  - US, UK near bottom (21% & 19%)

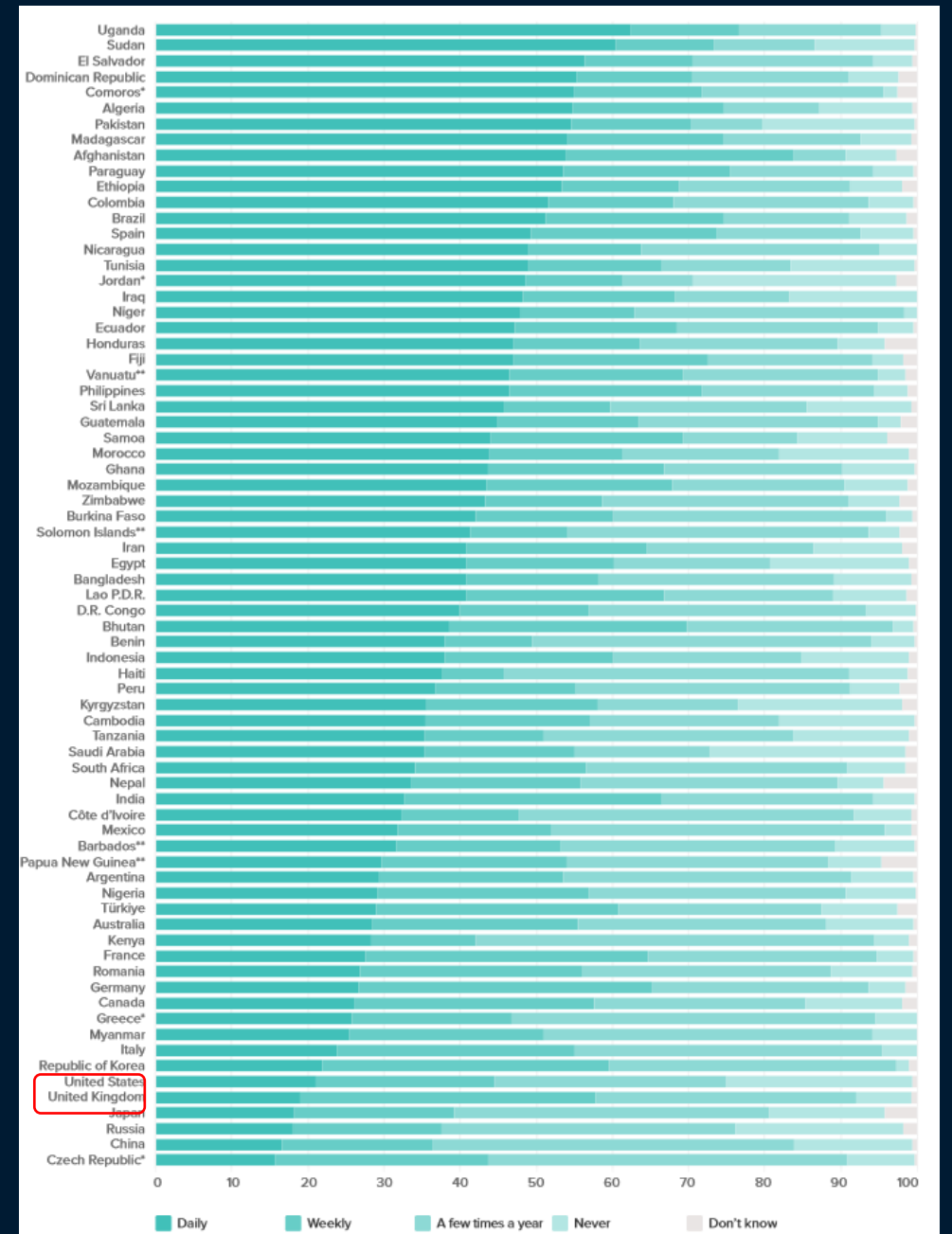


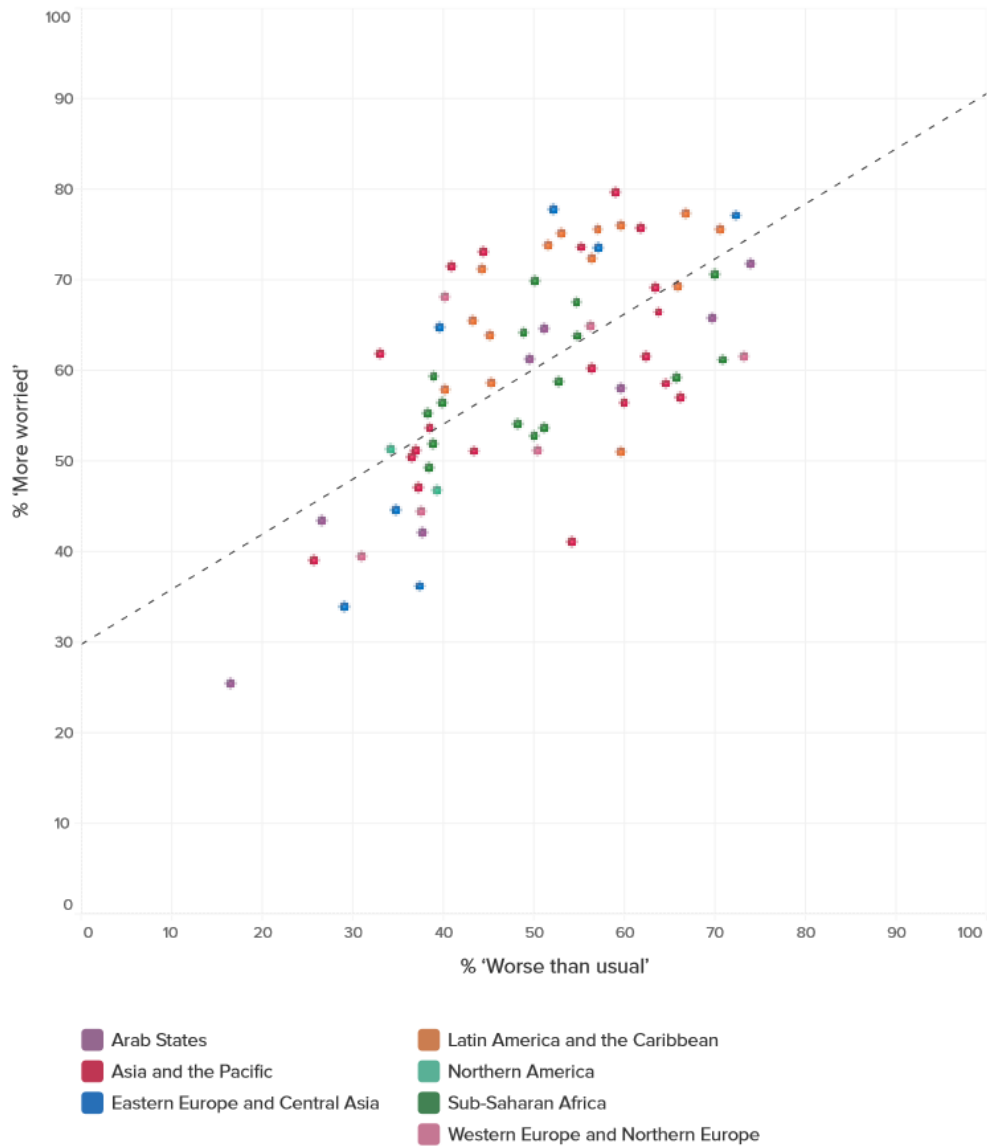
Figure 8: People's responses per country on how often they think about climate change.



## QUESTION

How much has climate change affected any big decisions for your family, such as where to live or work, or what to buy?

*More than two thirds of people (69 percent) said climate change is already impacting their big decisions*



**Figure 13:** Countries color-coded by region reporting that extreme weather has been worse than usual, plotted against percentage per country who say they are more worried about climate change than last year.



“the more people reported experiencing worse than usual extreme weather events ... the more likely they were to think about climate change, worry about it and factor it into big decisions”

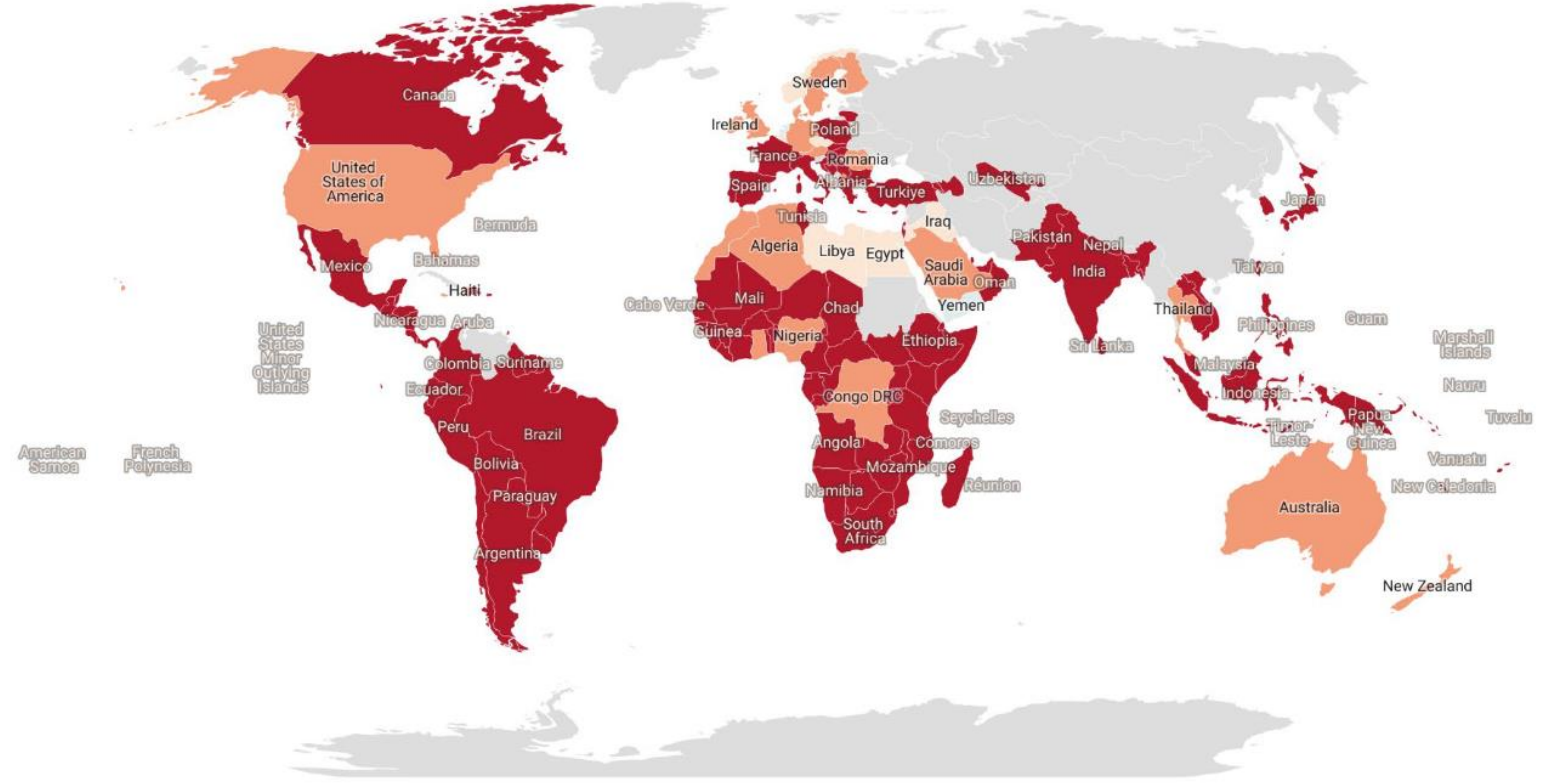
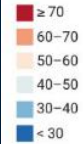
# INTERNATIONAL PUBLIC OPINION ON CLIMATE CHANGE

2023



## Worry about climate change

% who are 'very' or 'somewhat' worried about climate change

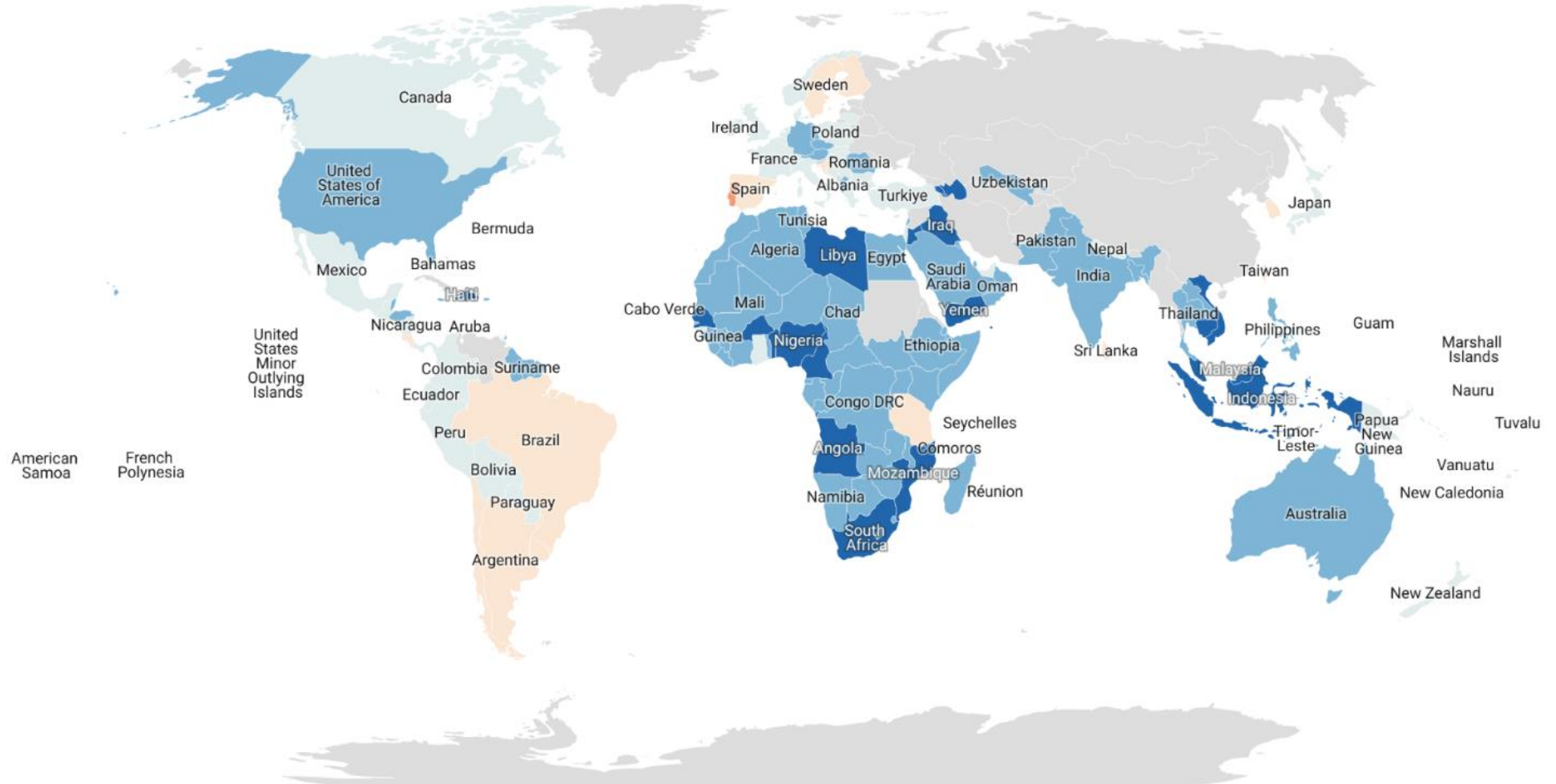
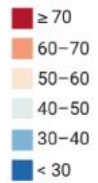


Source: Yale Program on Climate Change Communication / Data for Good at Meta / Rare's Center for Behavior & the Environment, 2023 · Created with Datawrapper

[climatecommunication.yale.edu/publications/international-public-opinion-on-climate-change-2023](https://climatecommunication.yale.edu/publications/international-public-opinion-on-climate-change-2023)

# Climate change is caused mostly by human activities

% who think climate change is mostly caused by humans



Source: Yale Program on Climate Change Communication / Data for Good at Meta / Rare's Center for Behavior & the Environment; 2023 • Created with Datawrapper



CLIMATE CHANGE  
IN THE AMERICAN MIND

# Beliefs & Attitudes

FALL 2023



CLIMATE  
CHANGE IN THE  
INDIAN MIND  
2023



Climate Change  
in the Indonesian Mind



Climate Change  
in the Irish Mind  
Wave 2 Report 1

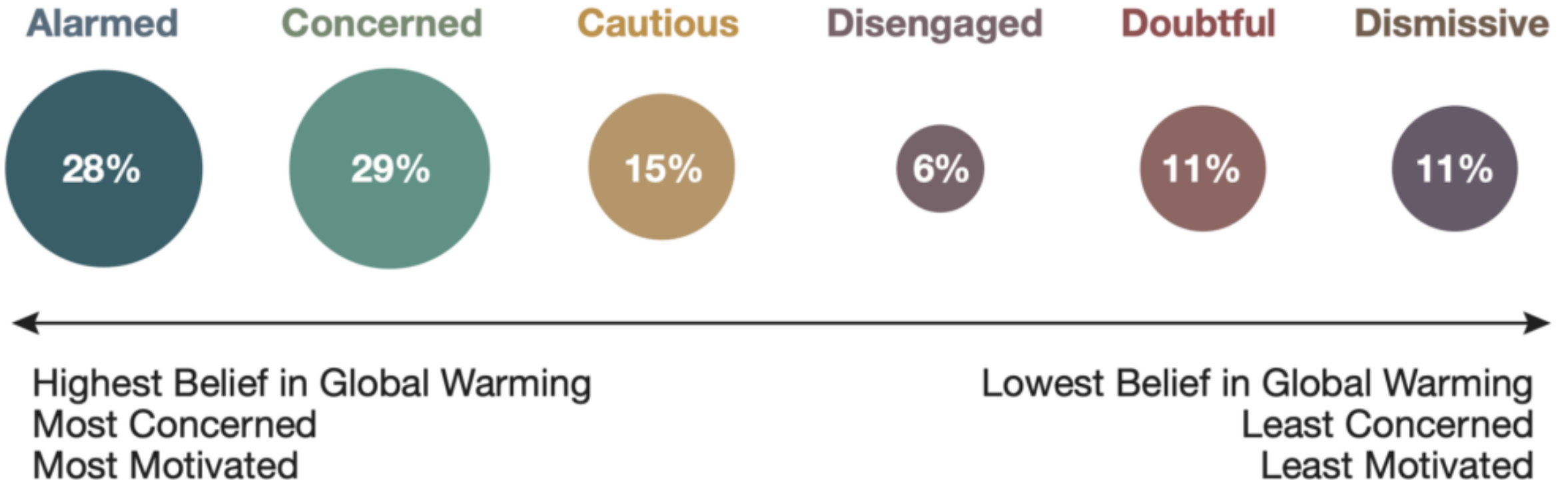


National Dialogue on Climate Action



Rialtas na hÉireann  
Government of Ireland

# Yale/GMU: “Global Warming’s Six Americas”

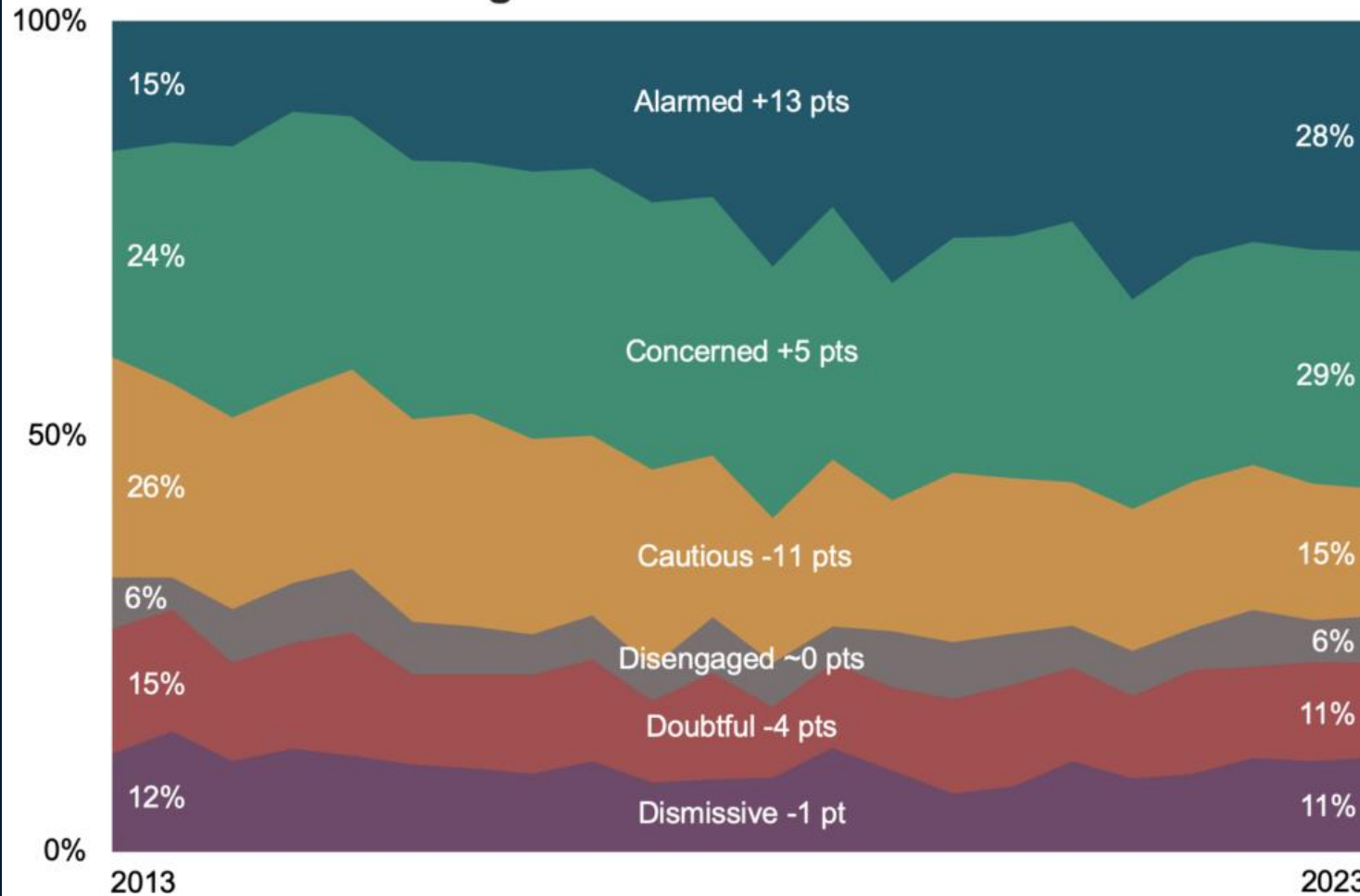


Global Warming’s Six Americas, Fall 2023

Base: 1,033 U.S. adults

Source: Yale Program on Climate Change Communication;  
George Mason University Center for Climate Change Communication

## Global Warming's Six Americas Over the Last Decade



Base: 25,368 U.S. adults. Data include 22 waves of national surveys spanning April 2013 – October 2023.

Source: Yale Program on Climate Change Communication;  
George Mason University Center for Climate Change Communication



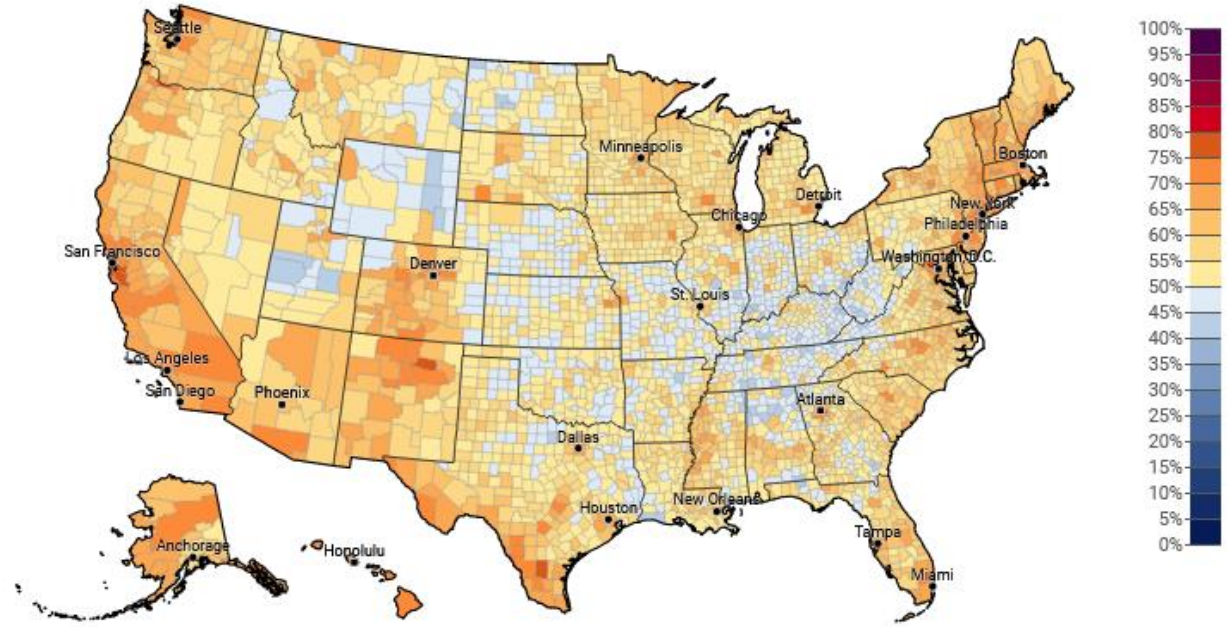
# Estimated % of adults who are worried about global warming (nat'l avg. 64%), 2023

Select Question: Worried about global warming

Click map or: Select a State Select a County

Absolute Value

National States Cong. Districts Metro Areas Counties

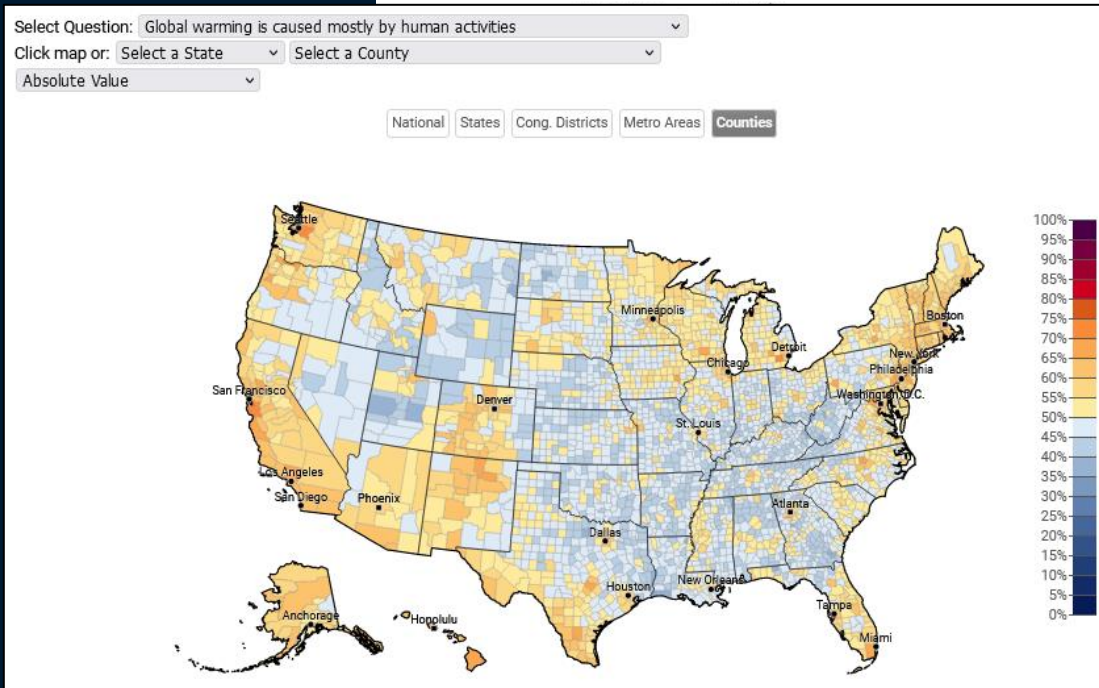
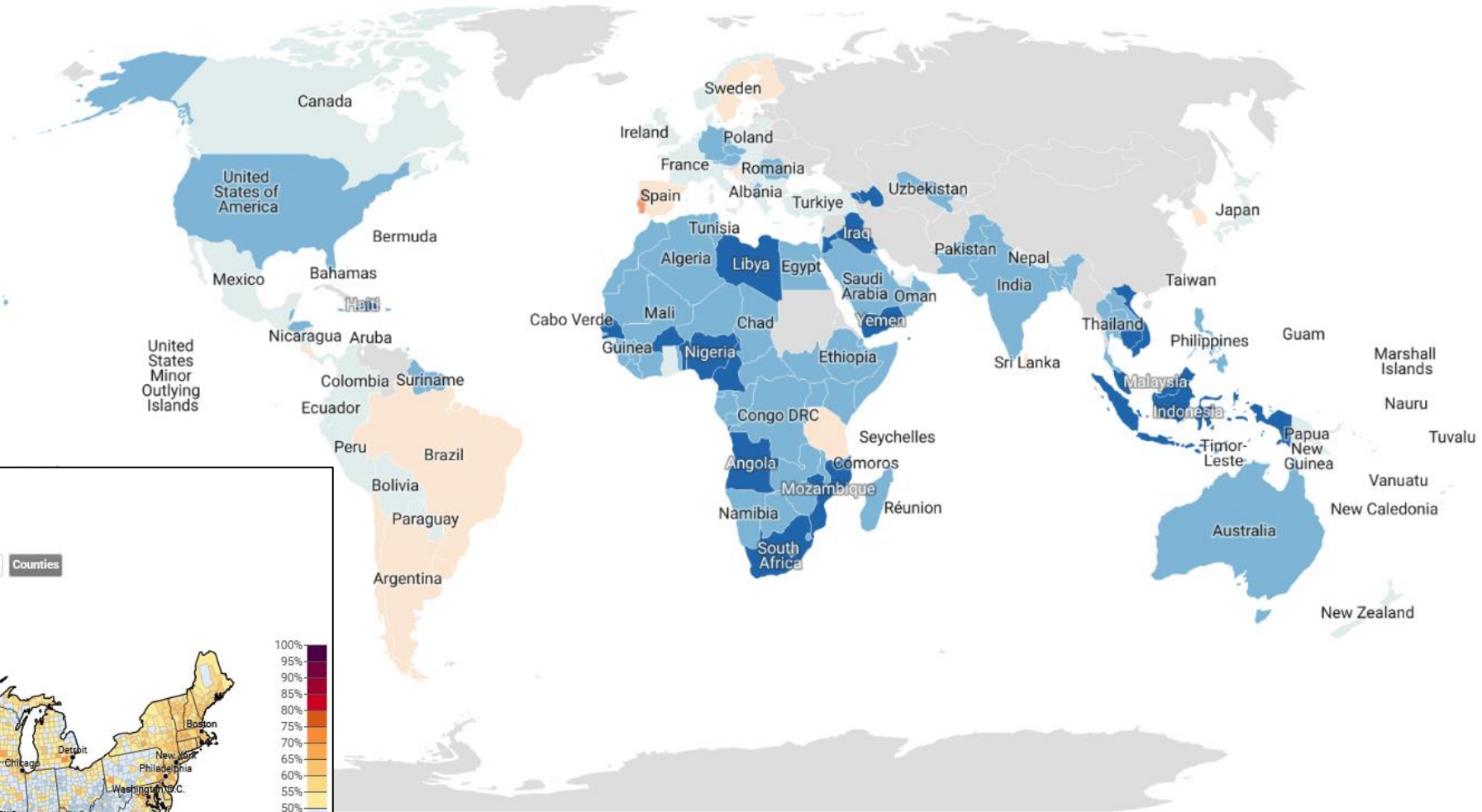
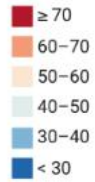


[climatecommunication.yale.edu/visualizations-data/ycom-us](https://climatecommunication.yale.edu/visualizations-data/ycom-us)



# Climate change is caused mostly by human activities

% who think climate change is mostly caused by humans

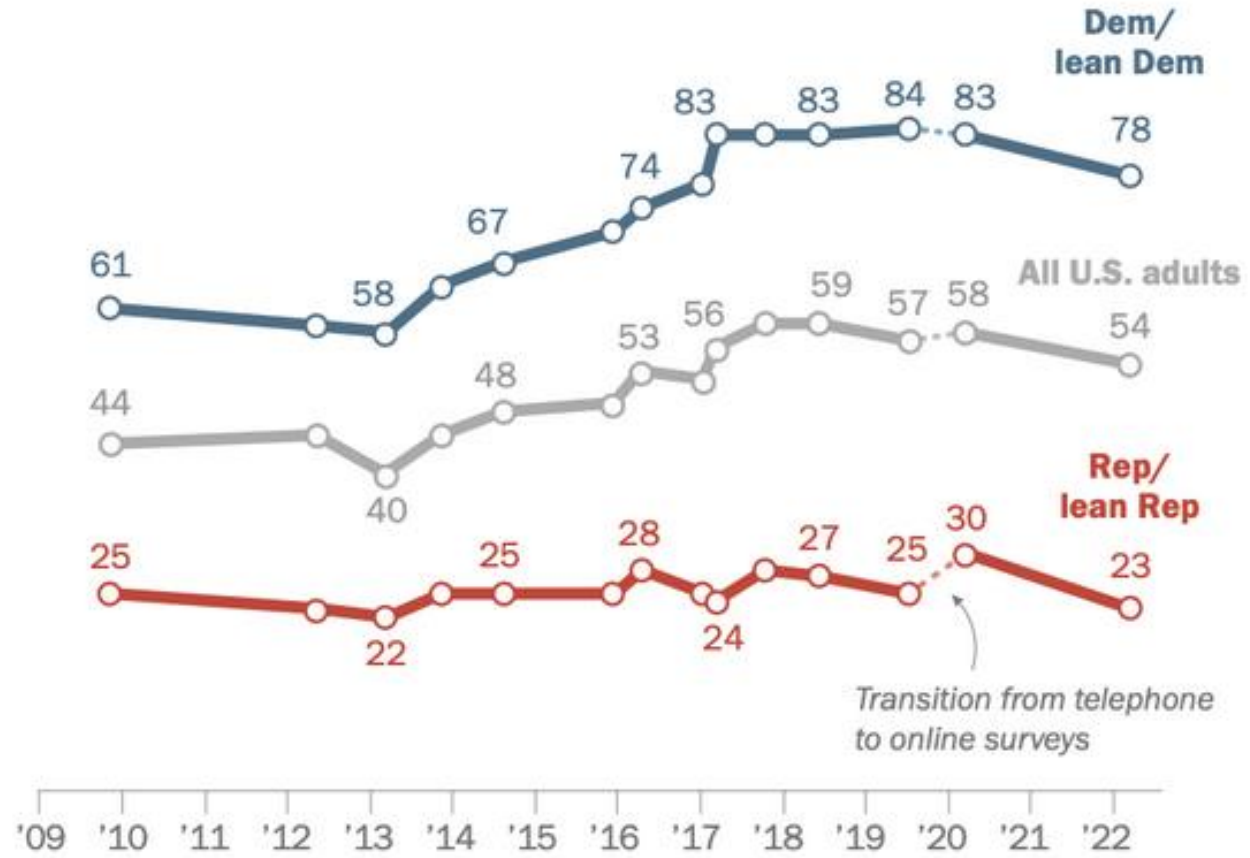


for Behavior & the Environment; 2023 • Created with Datawrapper



## 54% of Americans view climate change as a major threat, but the partisan divide has grown

% of U.S. adults who say global climate change is a major threat to the country



Note: Respondents who gave other responses or did not give an answer are not shown.  
Source: Survey conducted March 21-27, 2022.

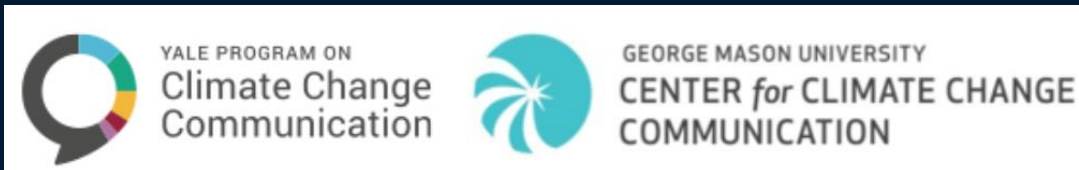
[www.pewresearch.org/short-reads/2023/08/09/what-the-data-says-about-americans-views-of-climate-change](https://www.pewresearch.org/short-reads/2023/08/09/what-the-data-says-about-americans-views-of-climate-change)

# Messengers



# How much do you trust or distrust the following as a source of information about global warming?

Liberal Democrats	Moderate/Conservative Democrats
Climate scientists	Climate scientists
Environmental organizations	EPA
EPA	Environmental organizations
NASA	NASA

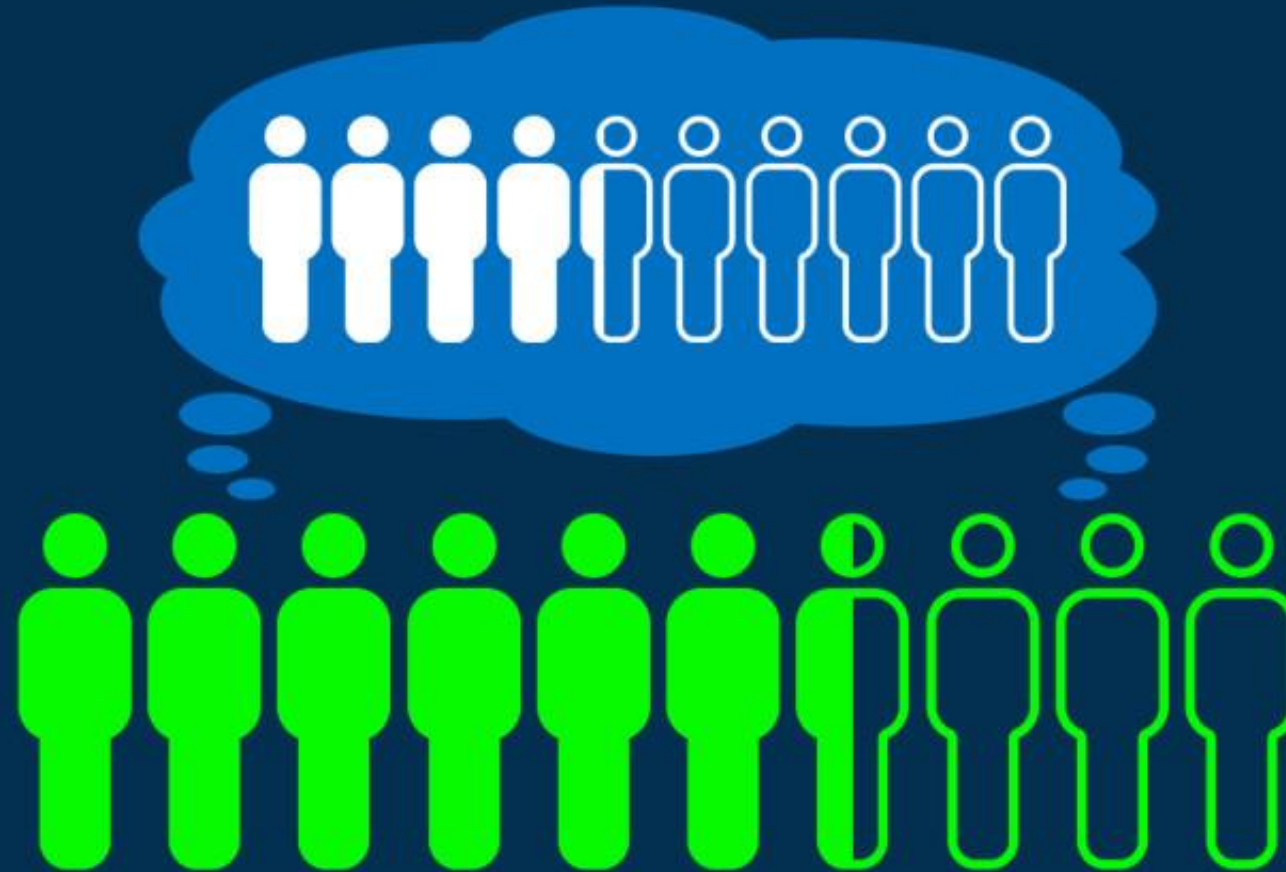


[climatecommunication.yale.edu/wp-content/uploads/2022/07/politics-global-warming-april-2022b.pdf](https://climatecommunication.yale.edu/wp-content/uploads/2022/07/politics-global-warming-april-2022b.pdf)

How much do you trust or distrust the following as a source of information about global warming?

Liberal Democrats	Moderate/Conservative Democrats	Liberal/Moderate Republicans	Conservative Republicans
Climate scientists	Climate scientists	NASA	Family & friends
Environmental organizations	EPA	Family & friends	Your primary care doctor
EPA	Environmental organizations	Your primary care doctor	NASA
NASA	NASA	Climate scientists	The Fox News Channel

**65% OF AMERICANS  
ARE CONCERNED ABOUT CLIMATE CHANGE...**  
but they think only 43% are.



Source: Yale Program on Climate Change Communication (2021) and Sparkman et al. (2022).

CLIMATE  CENTRAL

[climatecentral.org/climate-matters/climate-concern](https://climatecentral.org/climate-matters/climate-concern)



"Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period."

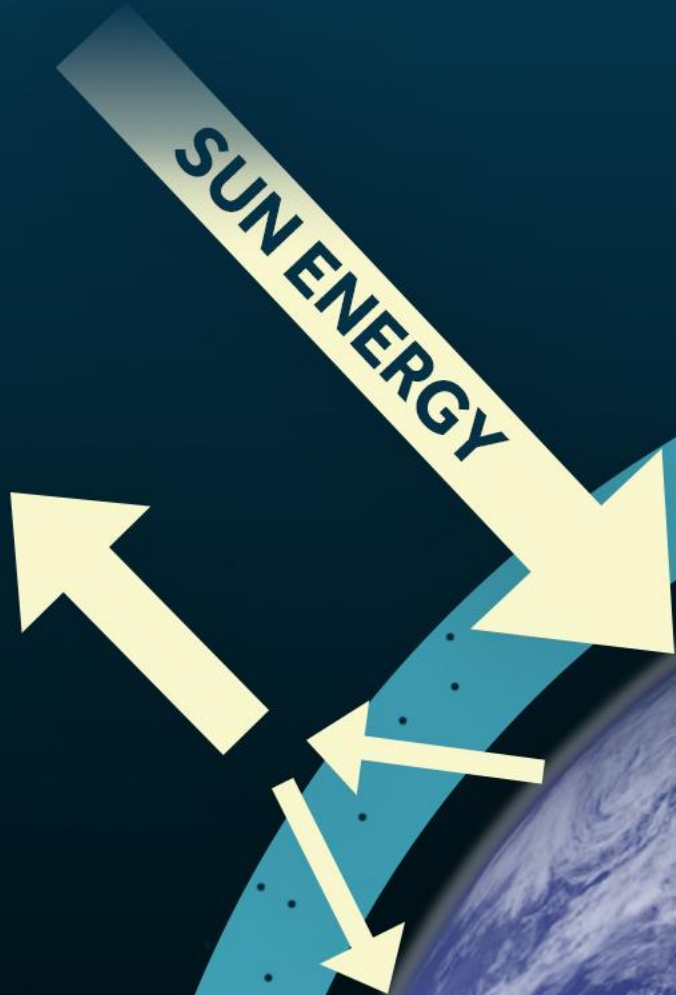
**2 years**



**10 years**

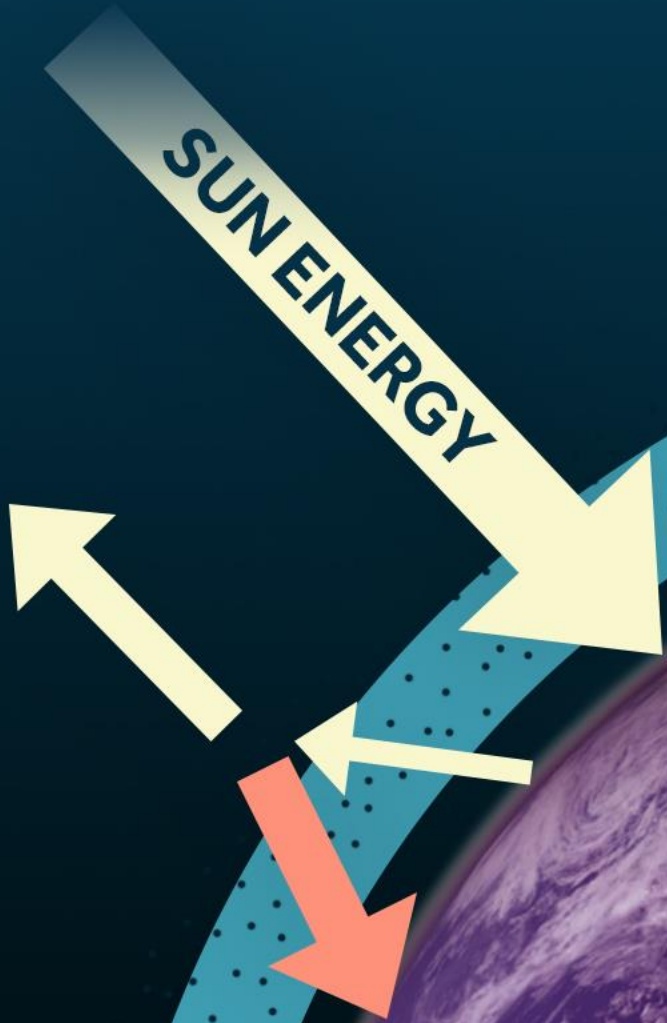


# Messages: Science basics



**SUN ENERGY**

**CARBON DIOXIDE BLANKET**



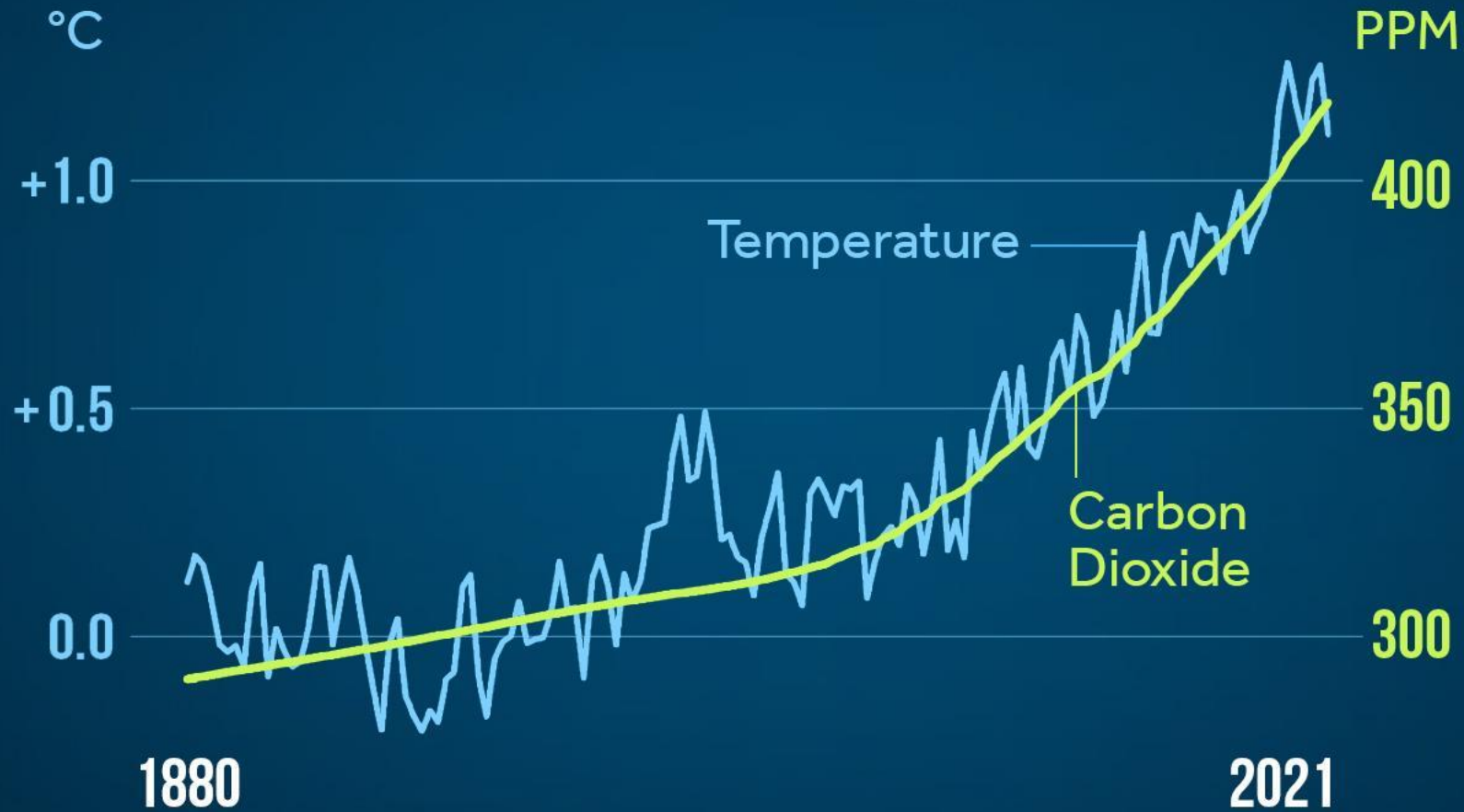
SUN ENERGY

CARBON DIOXIDE BLANKET





# TEMPERATURE & CARBON DIOXIDE



Global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910)  
Source: NASA GISS, NOAA NCEI, ESRL

CLIMATE  CENTRAL

[www.climatecentral.org/climate-matters/peak-co2-heat-trapping-emissions](http://www.climatecentral.org/climate-matters/peak-co2-heat-trapping-emissions)

# The atmosphere

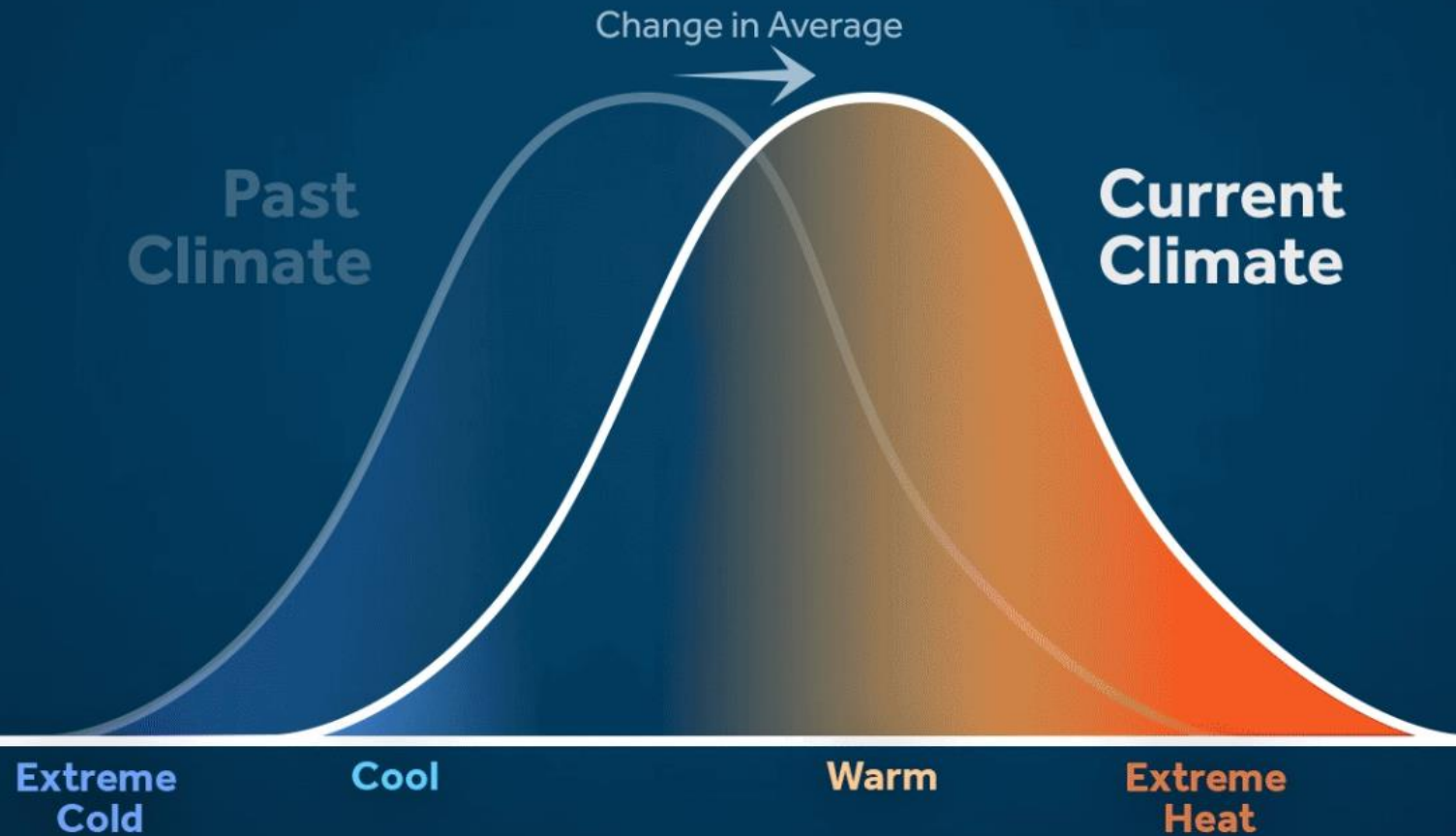
- Does not negotiate
- Cannot be bribed
- Always bats last

# Key sources of carbon pollution

- Burning fossil fuels
  - Oil
  - Gas
  - Coal
- Deforestation
- Agriculture



# SMALL CHANGE IN AVERAGE BIG CHANGE IN EXTREMES



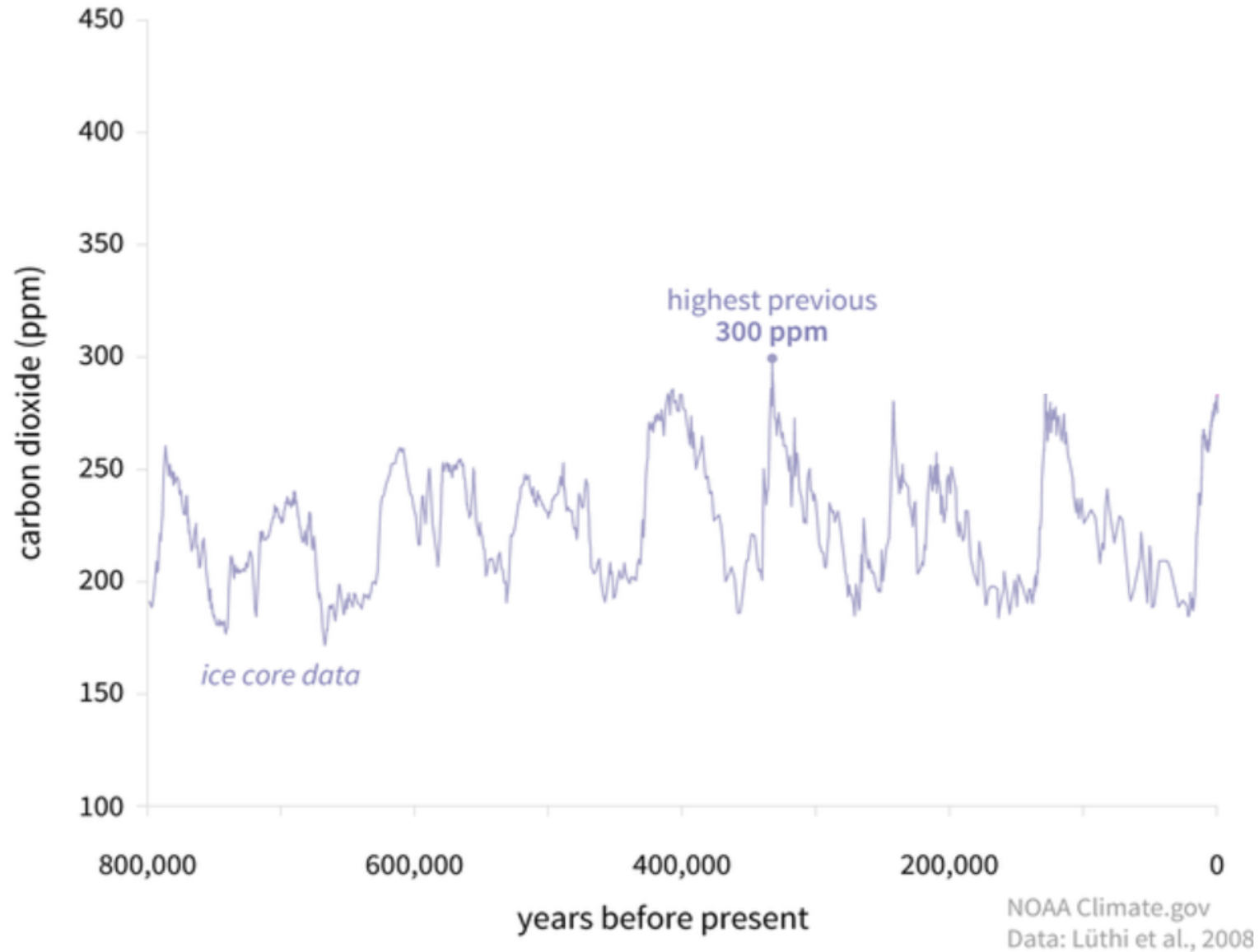
CLIMATE CENTRAL

[www.climatecentral.org/toolkit-heat](http://www.climatecentral.org/toolkit-heat)

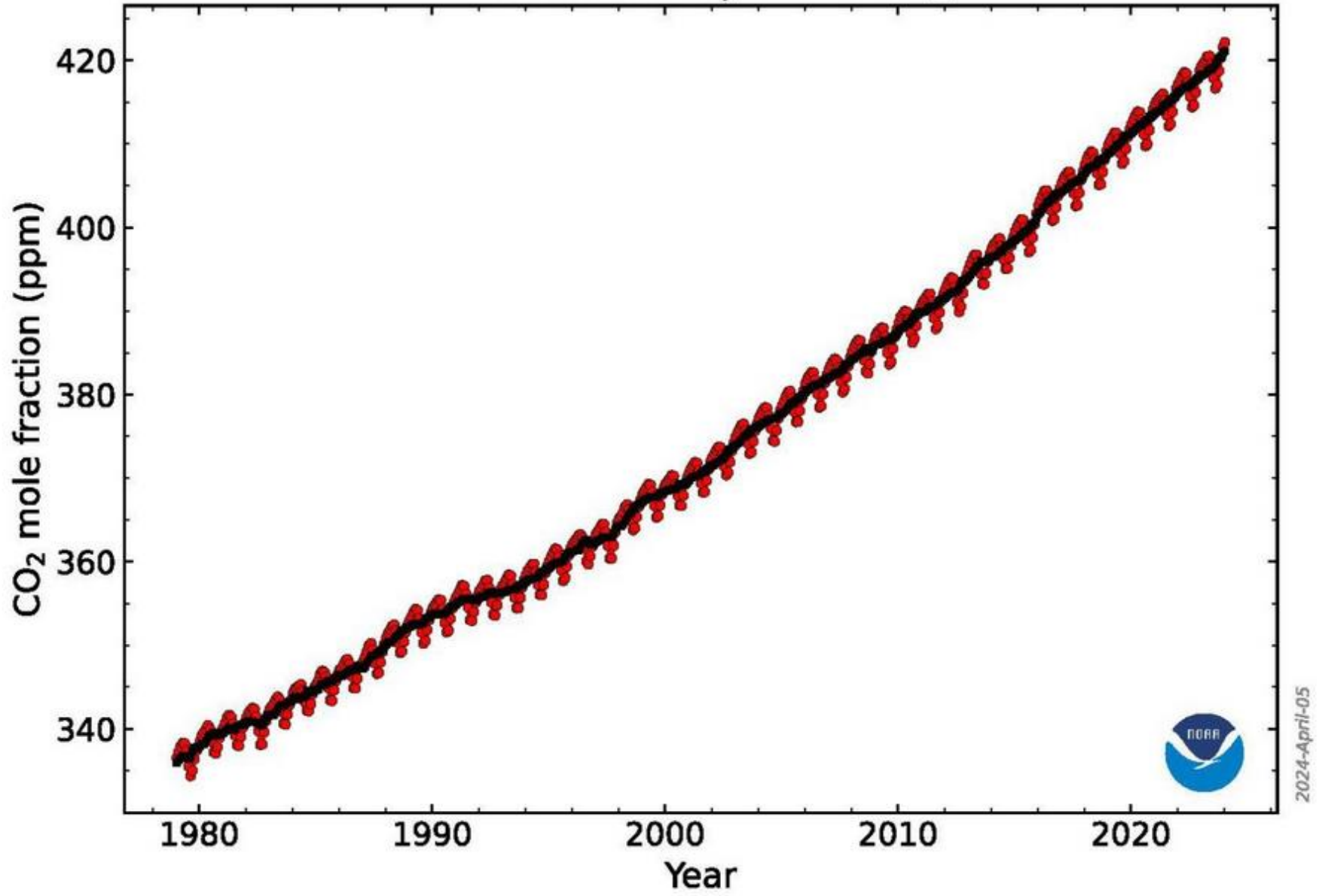
300 -  
1,000  
years



# CARBON DIOXIDE OVER 800,000 YEARS



# Global Monthly Mean CO<sub>2</sub>



[research.noaa.gov/2024/04/05/no-sign-of-greenhouse-gases-increases-slowing-in-2023/](https://research.noaa.gov/2024/04/05/no-sign-of-greenhouse-gases-increases-slowing-in-2023/)

# METHANE CONCENTRATION

PPB

1900

1850

1800

1750

1700

1650

1983

2021

80+

Atmospheric methane concentration  
Source: US EPA

CLIMATE  CENTRAL

[www.climatecentral.org/climate-matters/peak-co2-heat-trapping-emissions](http://www.climatecentral.org/climate-matters/peak-co2-heat-trapping-emissions)

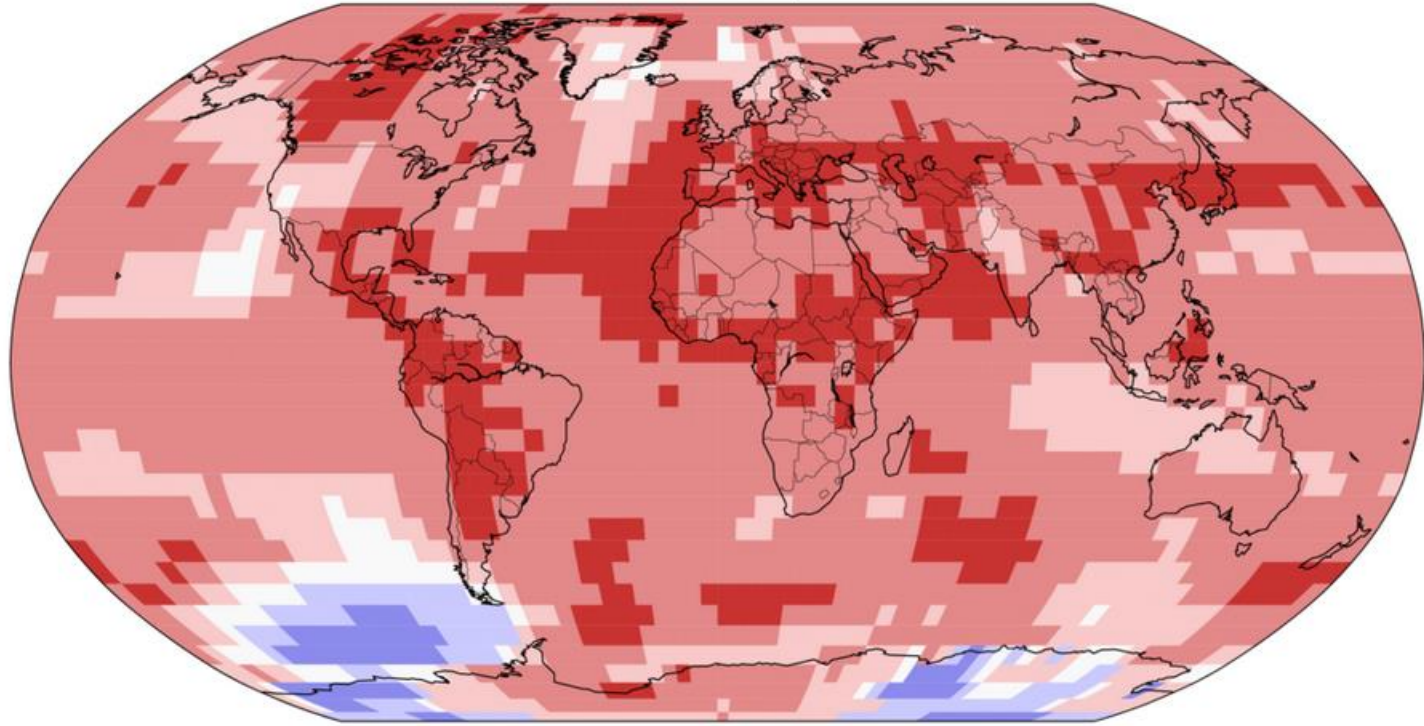
# Messages: Impacts



# Land & Ocean Temperature Percentiles Jan–Dec 2023

NOAA's National Centers for Environmental Information

Data Source: NOAA GlobalTemp v5.1.0–20240107



Record Coldest



Much Cooler than Average



Cooler than Average



Near Average



Warmer than Average



Much Warmer than Average



Record Warmest



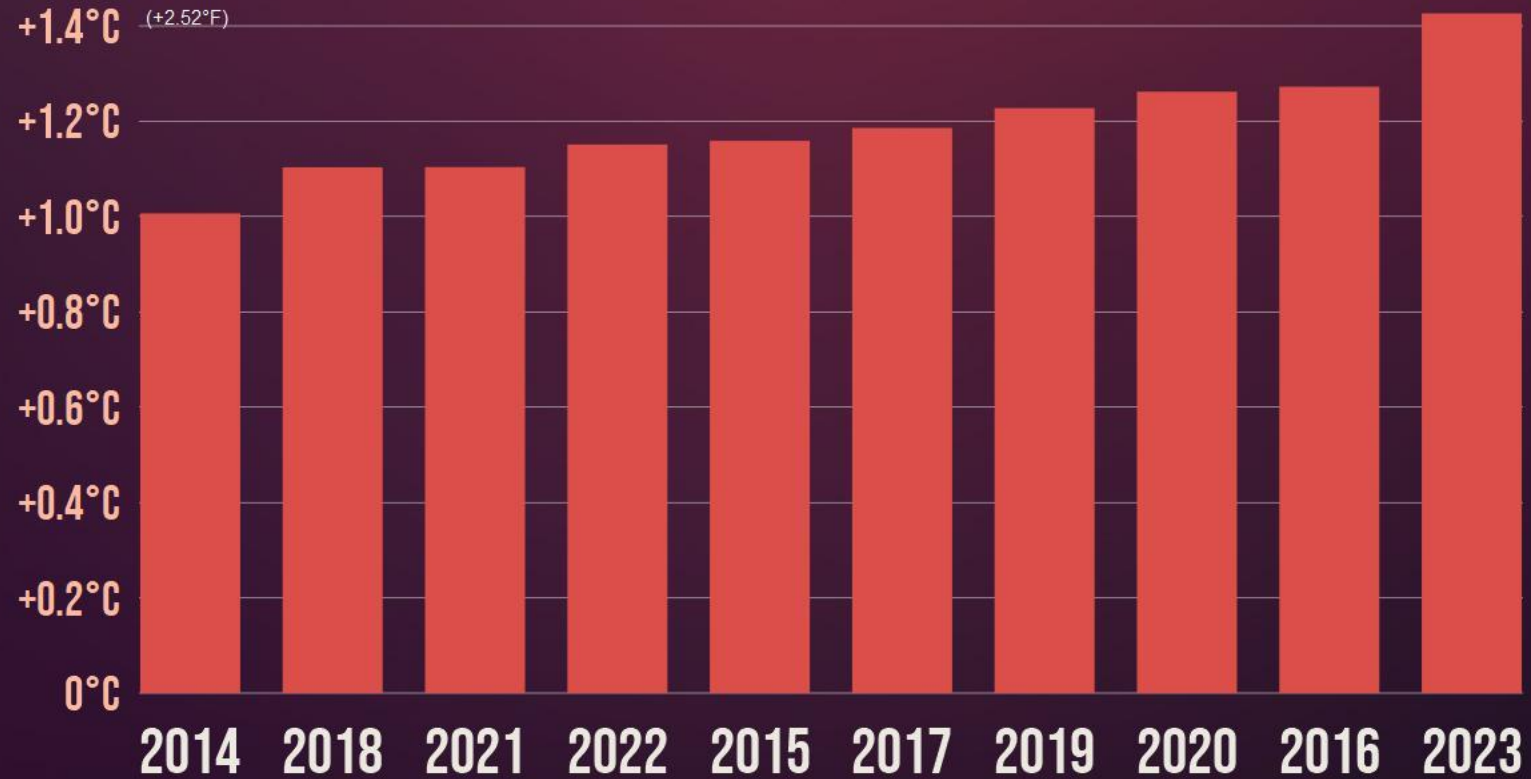
[www.noaa.gov/news/2023-was-worlds-warmest-year-on-record-by-far](https://www.noaa.gov/news/2023-was-worlds-warmest-year-on-record-by-far)

## May 2024 was Earth's warmest May on record

The globe saw its 12th-consecutive month of record warmth



# 10 HOTTEST GLOBAL YEARS ON RECORD



Global temperature anomalies (°C) averaged and adjusted to early industrial baseline (1881-1910).  
Data as of 1/12/2024.  
Source: NASA GISS & NOAA NCEI



# Heat-Related Deaths



[www.epa.gov/climate-indicators/health-society](http://www.epa.gov/climate-indicators/health-society)





Photo: Leopoldino Jeronimo

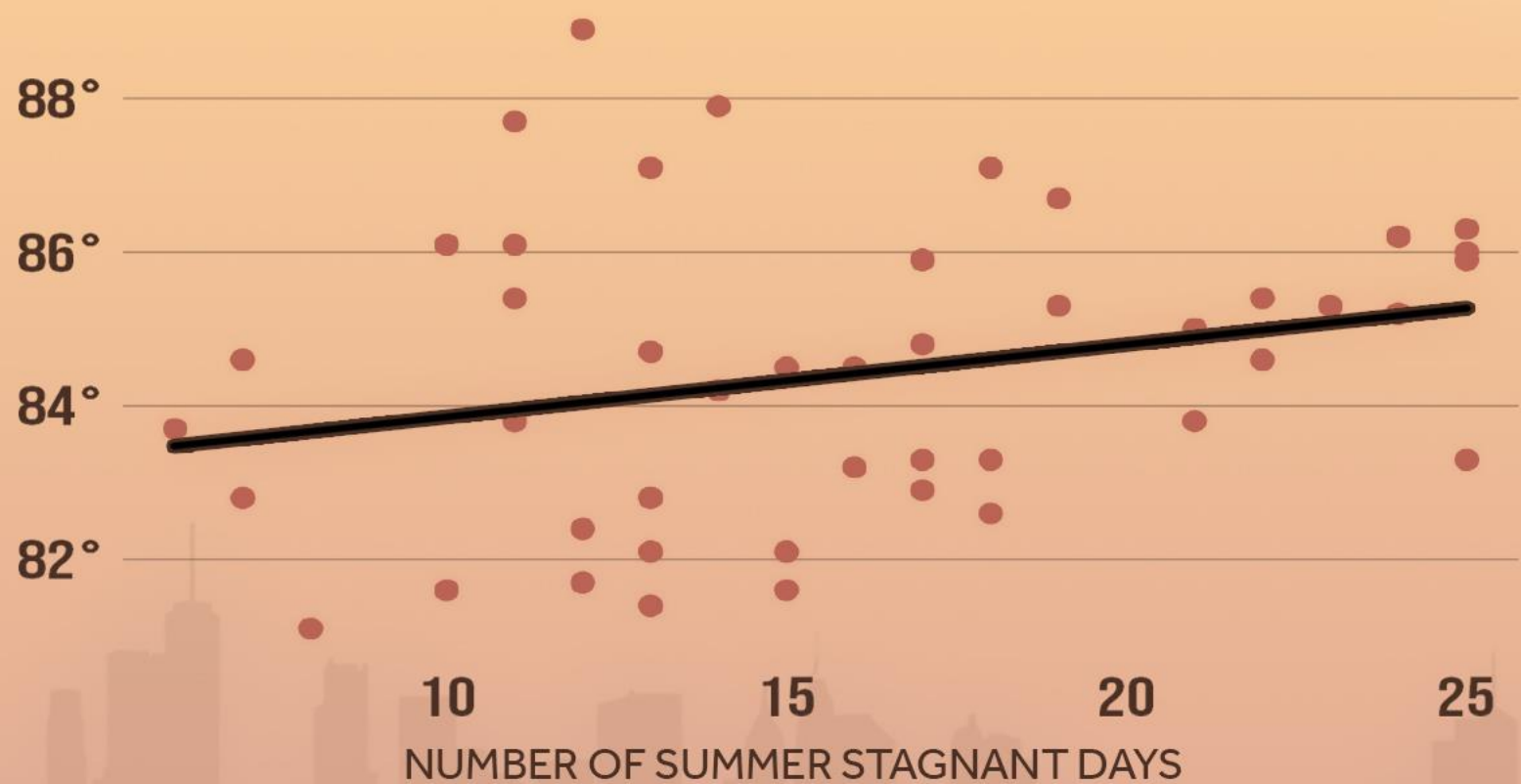


Photo: Leopoldino Jeronimo

- Extreme Heat
- Air Pollution

# NEWARK HIGHER TEMPERATURES = MORE STAGNANT AIR

SUMMER MAXIMUM TEMPERATURES SINCE 1973



Annual average summer maximum temperature vs. summer stagnant days (1973-2018)  
Source: NOAA/NCEI Air Stagnation Index, RCC-ACIS.org

CLIMATE CENTRAL





World  
Weather  
Attribution

## Northern Hemisphere 2022

“human-induced  
climate change made  
the observed soil  
moisture drought much  
more likely, by a factor  
of **at least 20**”



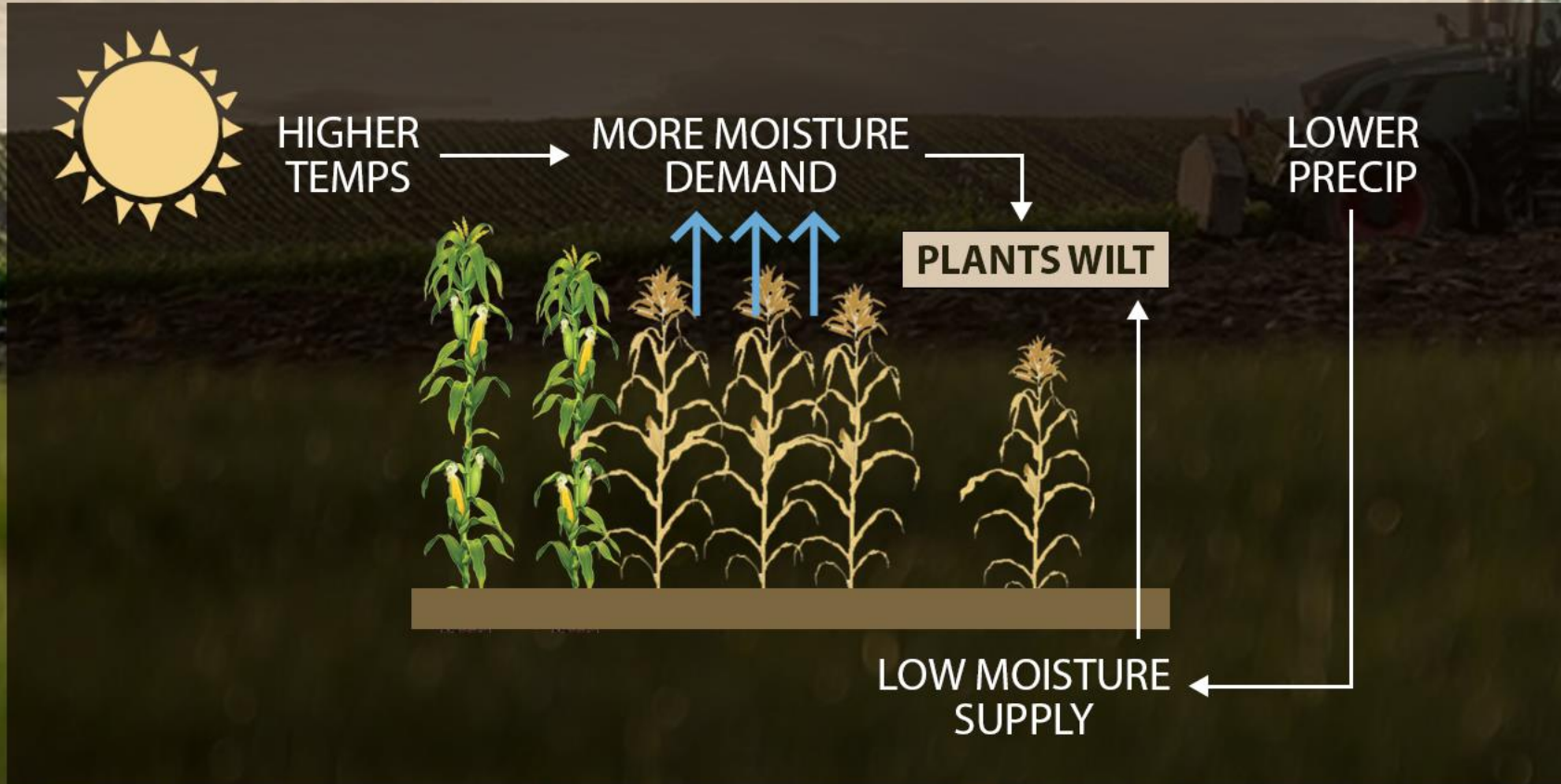
- Extreme Heat
- Air Pollution
- Drought

[www.worldweatherattribution.org/high-temperatures-exacerbated-by-climate-change-made-2022-northern-hemisphere-droughts-more-likely](http://www.worldweatherattribution.org/high-temperatures-exacerbated-by-climate-change-made-2022-northern-hemisphere-droughts-more-likely)



# HEAT AND DROUGHT CAUSE COMPOUND STRESS TO CROPS

- Extreme Heat
- Air Pollution
- Drought
- Ag impacts



Source: Adapted from Lesk et al. 2021

CLIMATE  CENTRAL

[www.climatecentral.org/climate-matters/climate-change-crops](http://www.climatecentral.org/climate-matters/climate-change-crops)

# FINANCIAL TIMES

- Extreme Heat
- Air Pollution
- Drought
- Ag impacts



## Climate change is pushing up food prices – and worrying central banks

Shifting weather patterns are reducing crop yields and squeezing supplies, creating what could become a permanent source of inflation

“Shifting weather patterns are reducing crop yields and squeezing supplies, creating what could become a permanent source of inflation”

3 July 2024



- Extreme Heat
- Air Pollution
- Drought
- Ag impacts
- Wildfire



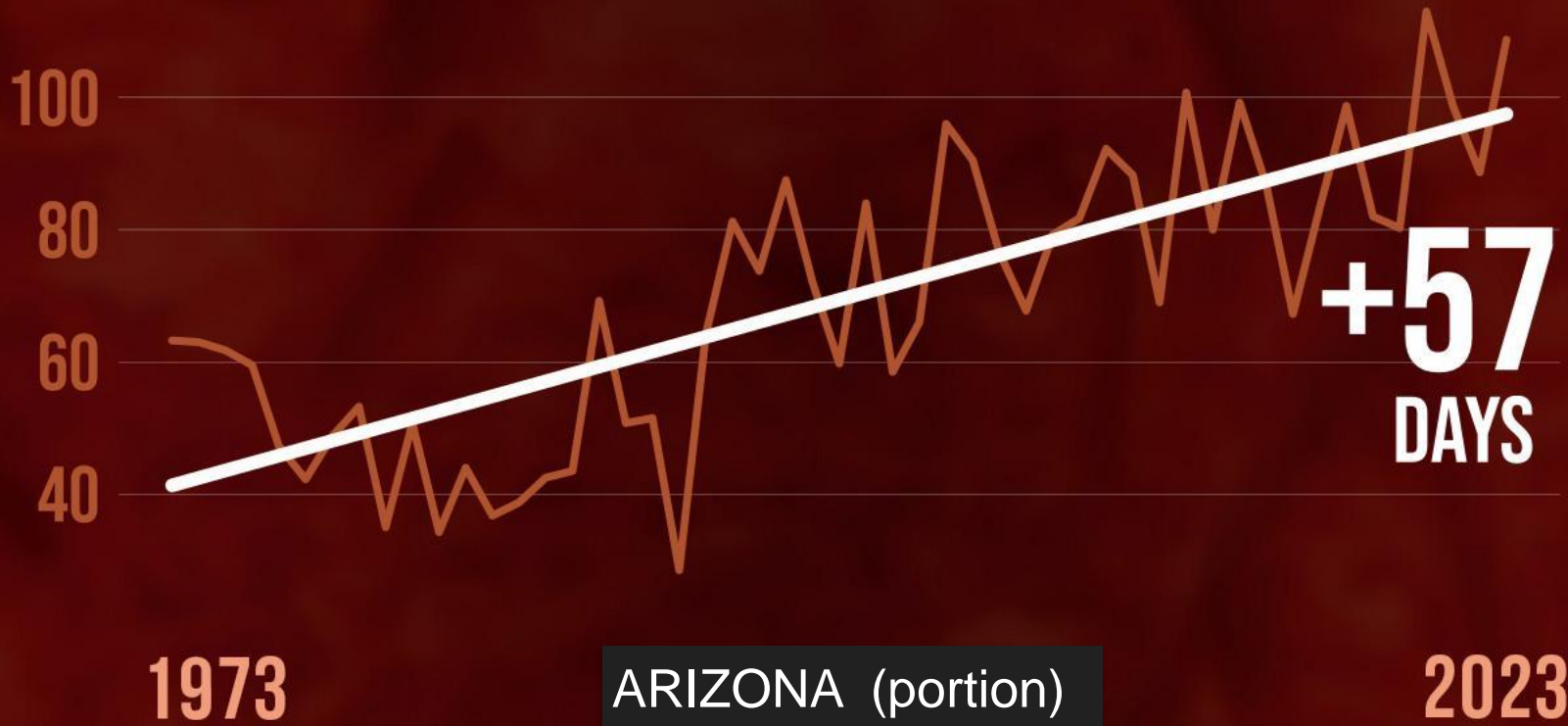
Photo: US Dept of Energy



# FIRE WEATHER DAYS

Annual hot, dry, windy days

- Extreme Heat
- Air Pollution
- Drought
- Ag impacts
- Wildfire



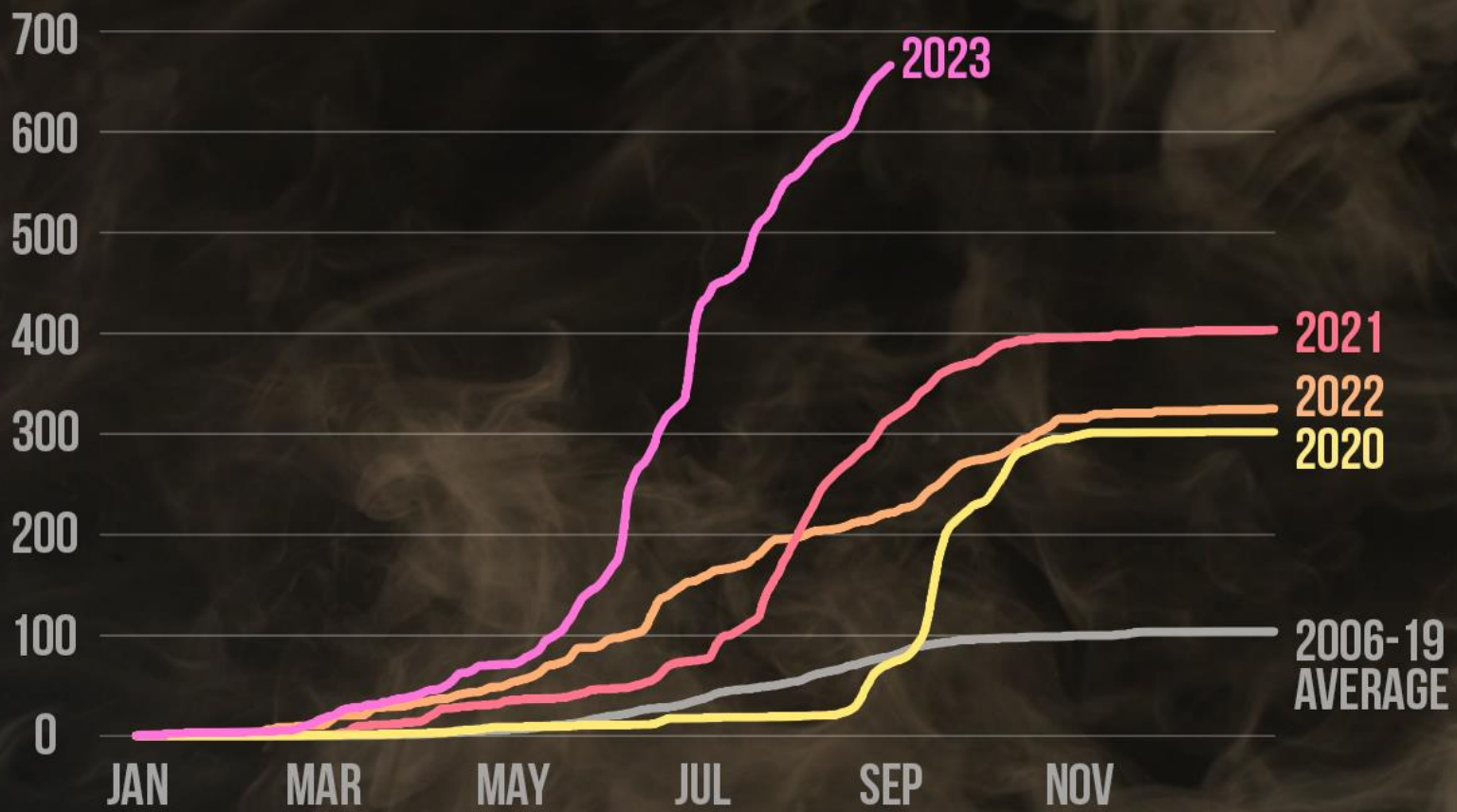
Annual days (1973-2023) at/above fire weather thresholds in at least two hourly observations per day. Stations with data in climate division: 4  
Source: NOAA/NCEI Local Climatological Data (LCD)

CLIMATE CENTRAL

# RECORD WILDFIRE SMOKE POLLUTION

Smoke PM2.5 ( $\mu\text{g}/\text{m}^3$ ) exposure per person in U.S.

- Extreme Heat
- Air Pollution
- Drought
- Ag impacts
- Wildfire



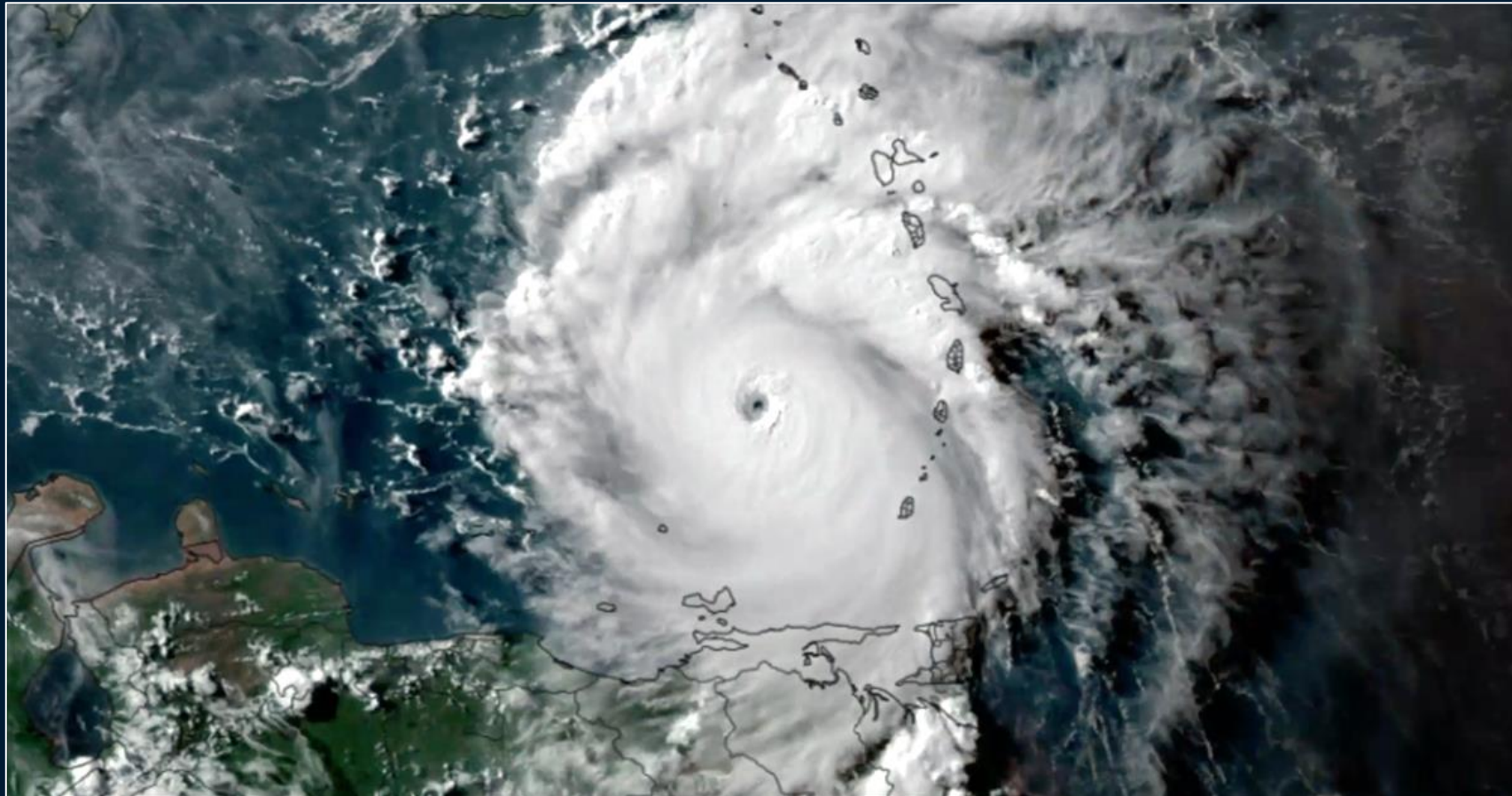
Cumulative smoke-related PM2.5 exposure per-person in U.S. Data through Aug 31, 2023.  
Source: Stanford Environmental Change and Human Outcomes Lab

CLIMATE CENTRAL

[www.climatecentral.org/climate-matters/wildfire-smoke-nationwide-health-risk-2023](http://www.climatecentral.org/climate-matters/wildfire-smoke-nationwide-health-risk-2023)

## “Category 5 Hurricane Beryl makes explosive start to 2024 Atlantic season”

- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones





- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones



Photo: UN Development Programme



# RECORD OCEAN HEAT

Daily global sea surface temperature (°F)



- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones
- Floods
- Ocean impacts

Source: NOAA OISST

CLIMATE CENTRAL



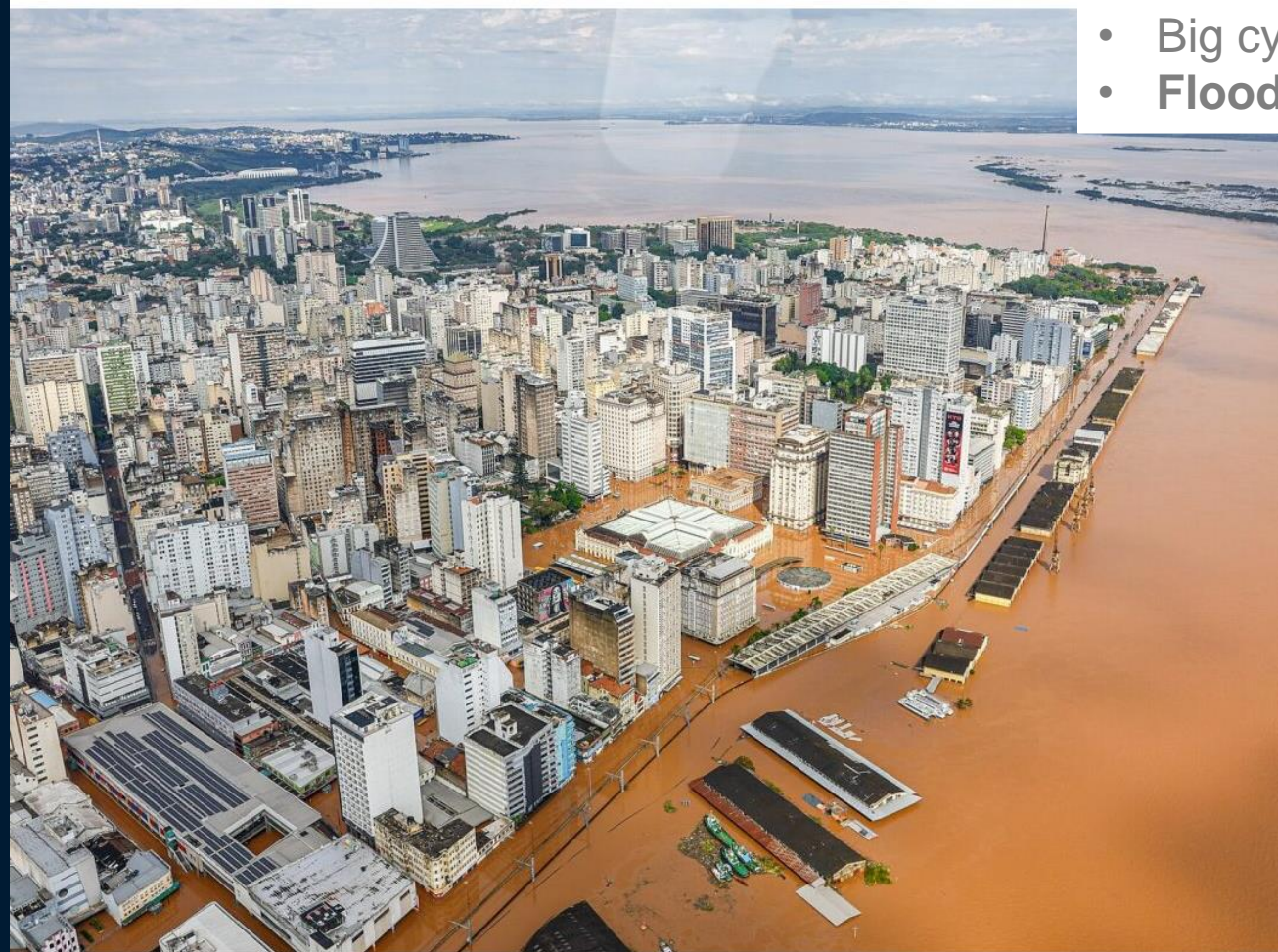


World  
Weather  
Attribution

# Brazil floods May 2024

- 2x more likely
- 6-9% more intense

- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones
- **Floods**



in Porto Alegre, Rio Grande do Sul on May 5, 2024. Image by Ricardo Stuckert / PR.

- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones
- Floods

# *‘Very Dire’: Devastated by Floods, Pakistan Faces Looming Food Crisis*

PAKISTAN · Published October 3, 2022 5:46pm EDT

## **Pakistan hospital overwhelmed as flood-borne illnesses spread**

[www.nytimes.com/2022/09/11/world/asia/pakistan-floods-food-crisis.html](https://www.nytimes.com/2022/09/11/world/asia/pakistan-floods-food-crisis.html)



- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones
- Floods
- Ocean impacts

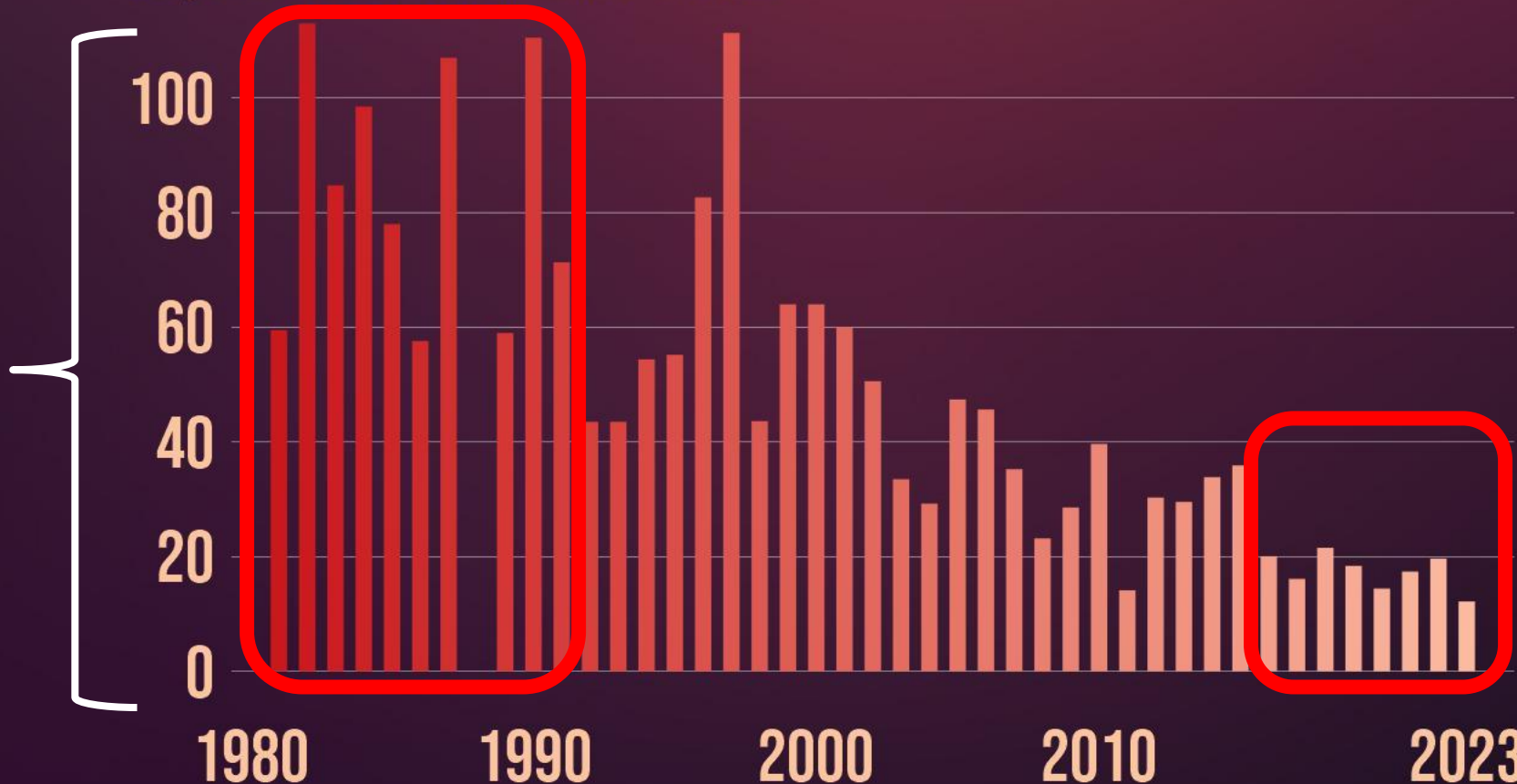
Photo:  
NOAA



# LESS TIME BETWEEN DISASTERS

Days between billion-dollar events

Inflation-adjusted



Average number of days between billion-dollar disasters each calendar year.  
No disasters in 1987; one in 1988. Data as of 1/9/2024.  
Source: NOAA/NCEI

CLIMATE CENTRAL

- Extreme heat
- Air pollution
- Drought
- Ag productivity
- Wildfire
- Big cyclones
- Floods
- Ocean impacts

"Climate change is a crisis multiplier, and we see the effects of climate change all over the world."

-- NATO Secretary  
General Jens Stoltenberg

[energy.economictimes.indiatimes.com/news/renewable/nato-chief-says-climate-change-undermines-global-security/108580273](https://energy.economictimes.indiatimes.com/news/renewable/nato-chief-says-climate-change-undermines-global-security/108580273)

# Climate change makes every other challenge worse

Economic development, Inequality, Health, Migration, National security, Biodiversity



# Disenfranchised by Climate Change



# FOREIGN AFFAIRS

JUNE 5, 2024

---

## How Climate Change Threatens Democracy

---

Extreme Weather Now Affects Elections All Over  
the World

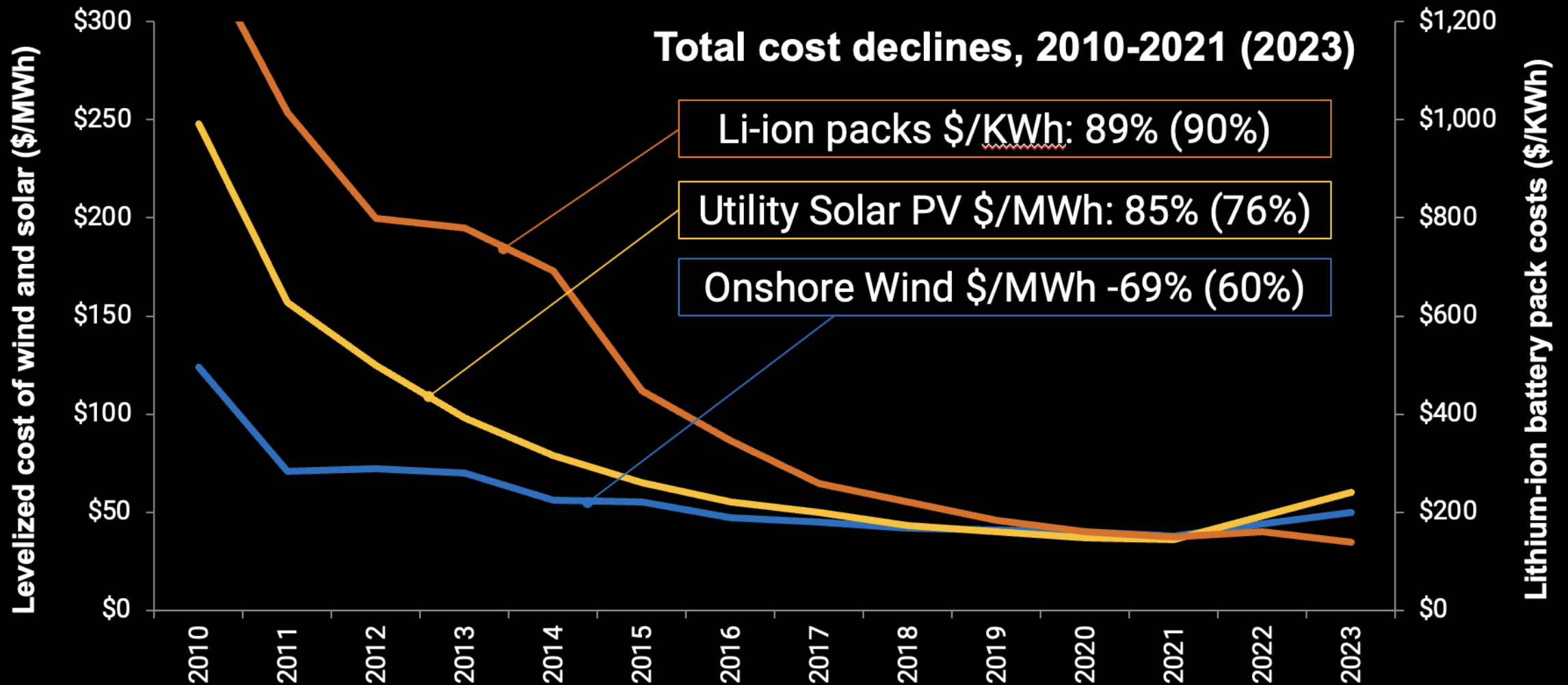
KAREN FLORINI AND ALICE C. HILL



Photos: NREL



# Wind, solar, and battery costs have plummeted...

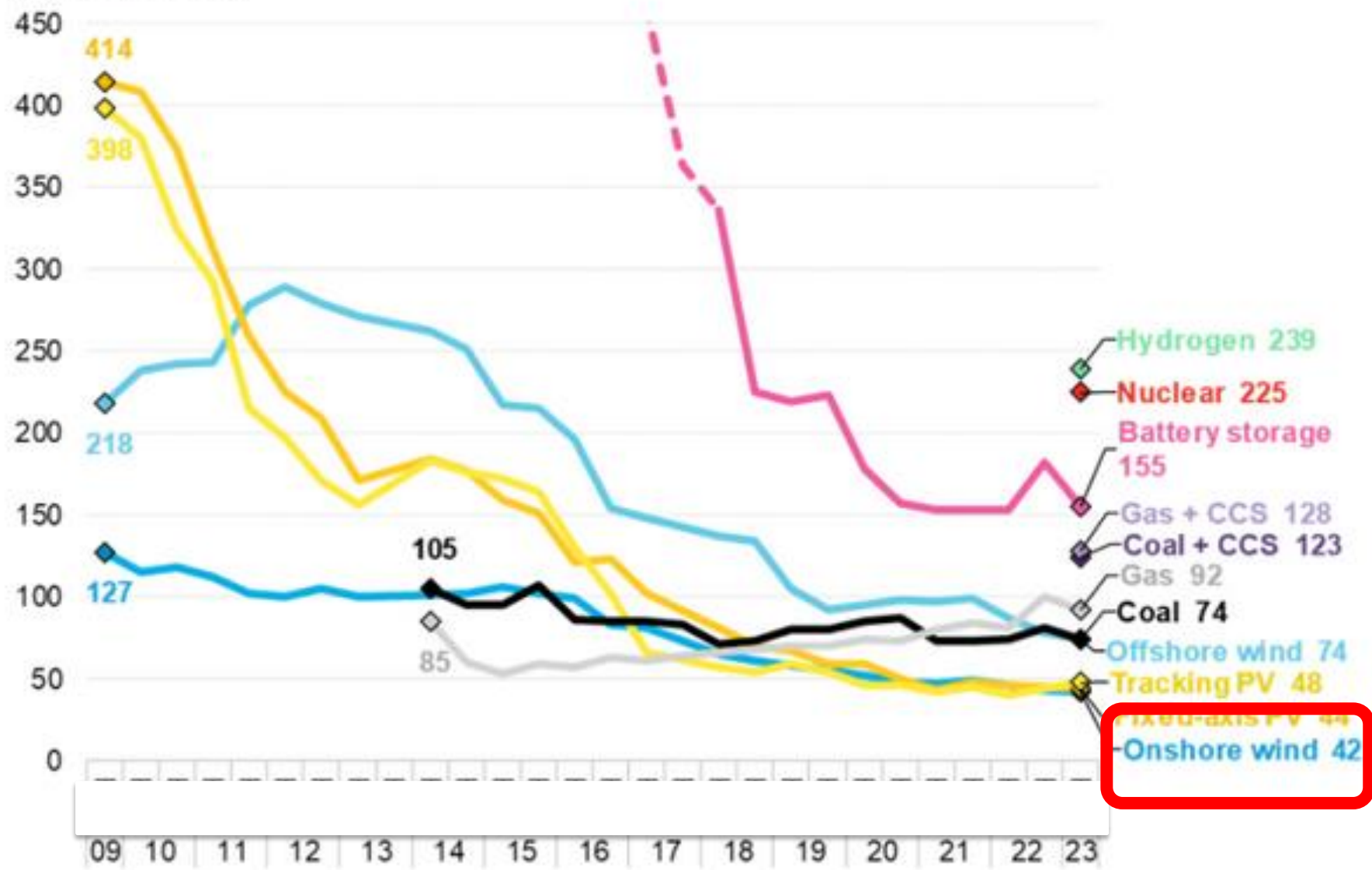


Data Sources: Wind & solar costs from Lazard (2023), 2023 Levelized Cost of Energy+.  
Battery pack costs from Bloomberg New Energy Finance (2023), Battery Price Survey.

Courtesy of Prof. Jesse Jenkins, Princeton

Figure 1: Global levelized cost of electricity benchmarks, 2009-2023

\$/MWh (real 2022)



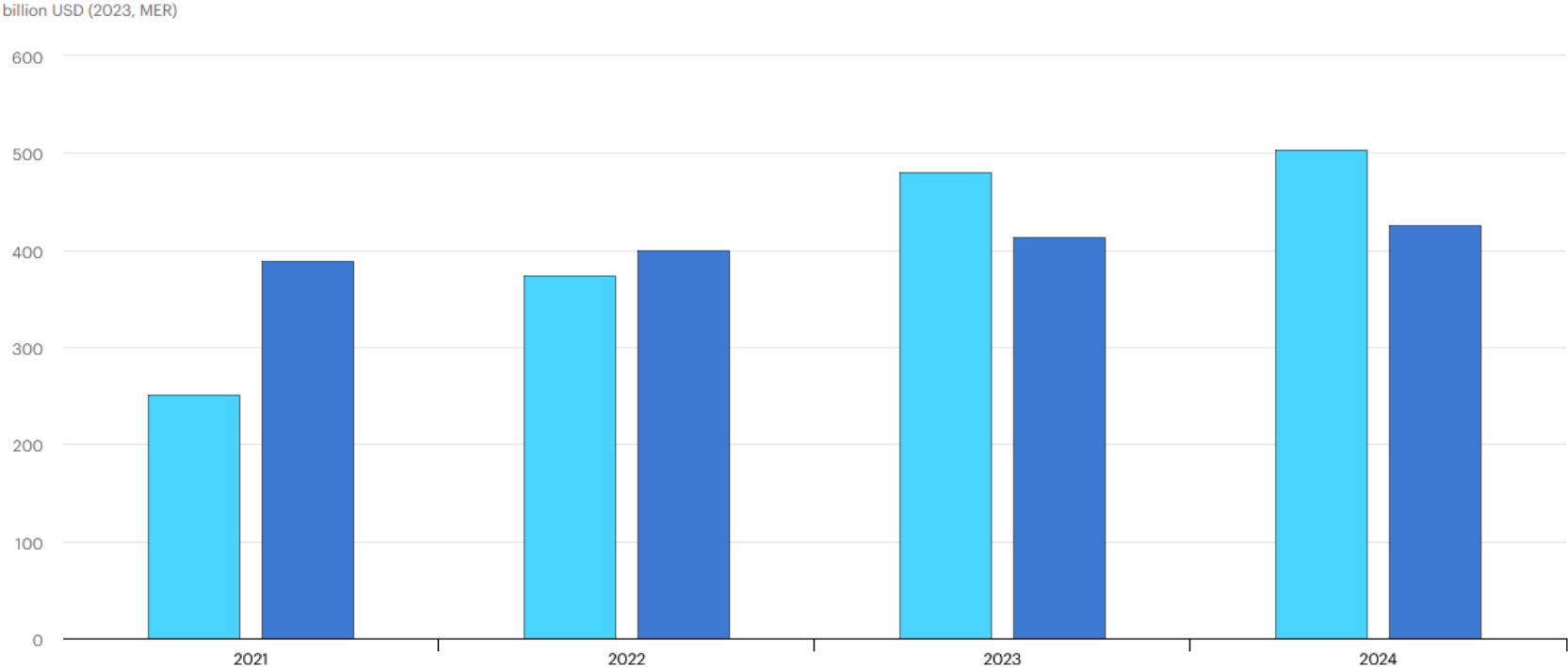
[about.bnef.com/blog/cost-of-clean-energy-technologies-drop-as-expensive-debt-offset-by-cooling-commodity-prices](https://about.bnef.com/blog/cost-of-clean-energy-technologies-drop-as-expensive-debt-offset-by-cooling-commodity-prices)



# Investment in solar PV now surpasses all other generation technologies combined

Global annual investment in solar PV and other generation technologies, 2021-2024

Open ↗



IEA, Licence: CC BY 4.0

● Solar PV ● Other

International Energy Agency, World Energy Investment 2024



# Clean energy investment is nearly double fossil fuel spending

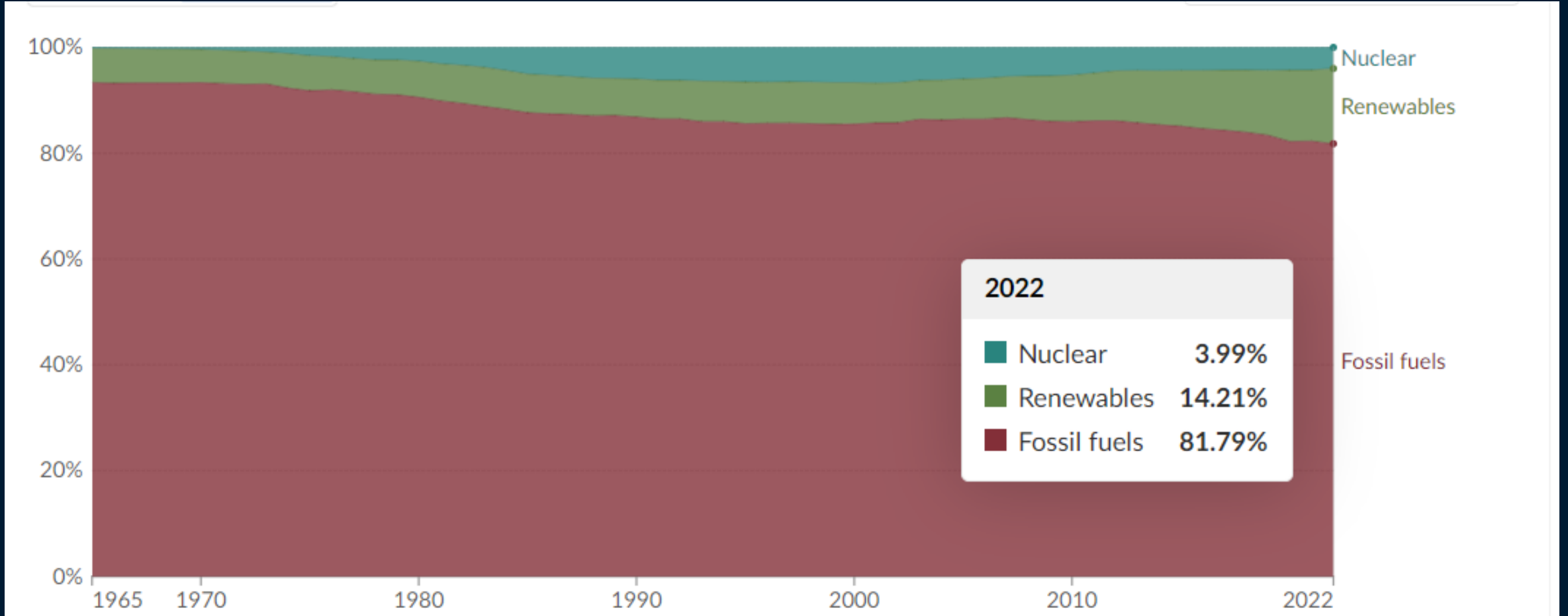


CANARY MEDIA | CHART OF THE WEEK

International Energy Agency, [World Energy Investment 2024](#).

# Primary energy consumption from fossil fuels, nuclear and renewables

Our World  
in Data



# Our World in Data

[ourworldindata.org/](https://ourworldindata.org/)

# Global greenhouse gas emissions and warming scenarios

- Each pathway comes with uncertainty, marked by the shading from low to high emissions under each scenario.
- Warming refers to the expected global temperature rise by 2100, relative to pre-industrial temperatures.

Annual global greenhouse gas emissions  
in gigatonnes of carbon dioxide-equivalents

150 Gt

100 Gt

50 Gt

Greenhouse gas emissions  
up to the present

0

1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100

## No climate policies

4.1 – 4.8 °C

→ expected emissions in a baseline scenario if countries had not implemented climate reduction policies.

## Current policies

2.5 – 2.9 °C

→ emissions with current climate policies in place result in warming of 2.5 to 2.9°C by 2100.

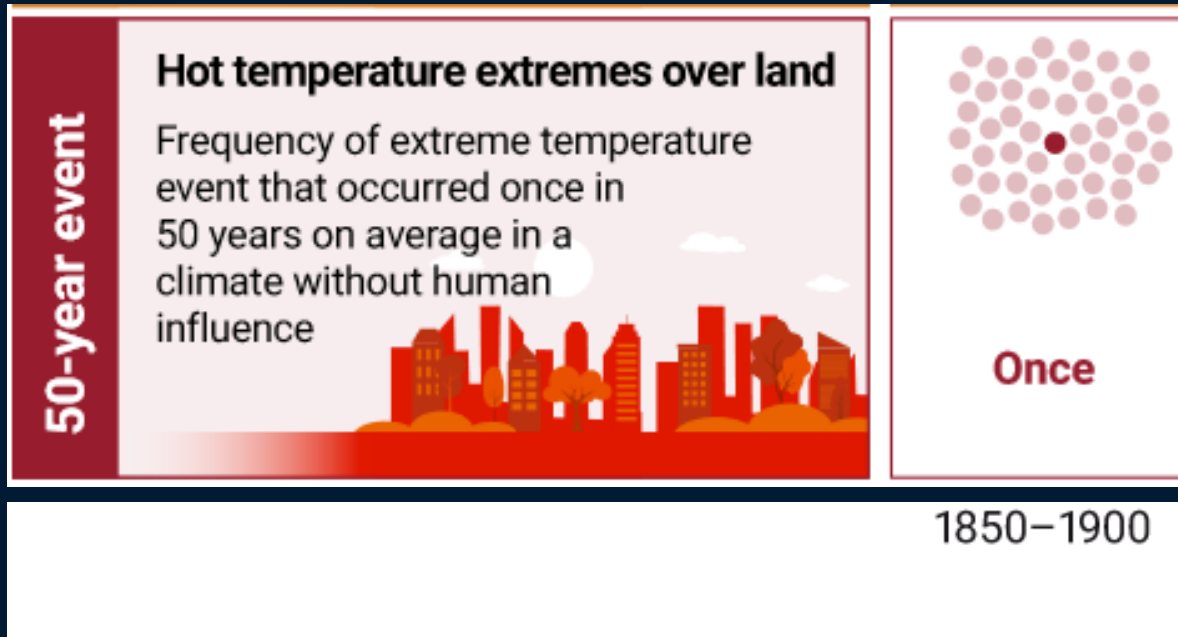
## Pledges & targets (2.1 °C)

→ emissions if all countries delivered on reduction pledges result in warming of 2.1°C by 2100.

## 2°C pathways

1.5°C pathways





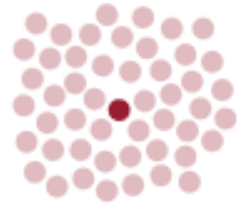
UNEP Emissions Gap Report 2023

[wedocs.unep.org/bitstream/handle/20.500.11822/43922/EGR2023.pdf](https://wedocs.unep.org/bitstream/handle/20.500.11822/43922/EGR2023.pdf)

50-year event

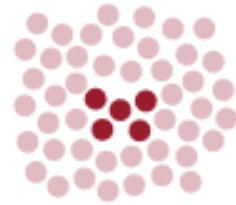
### Hot temperature extremes over land

Frequency of extreme temperature event that occurred once in 50 years on average in a climate without human influence



Once

1850–1900



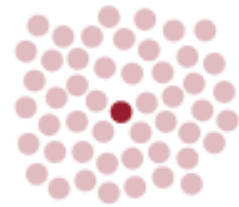
now likely to occur  
**4.8 times**  
(2.3-6.4)

Present, 1.1°C

50-year event

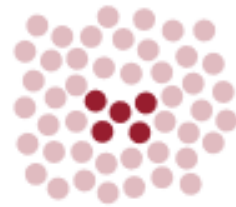
### Hot temperature extremes over land

Frequency of extreme temperature event that occurred once in 50 years on average in a climate without human influence



Once

1850–1900



now likely to occur  
**4.8 times**  
(2.3-6.4)

Present, 1.1°C



will likely occur  
**8.6 times**  
(4.3-10.7)

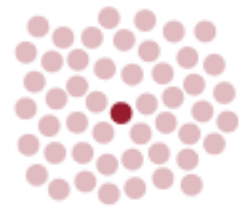
1.5°C

Future

50-year event

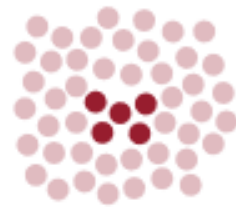
### Hot temperature extremes over land

Frequency of extreme temperature event that occurred once in 50 years on average in a climate without human influence



Once

1850–1900



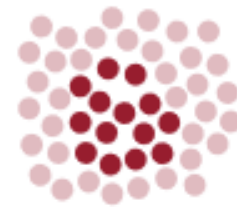
now likely to occur  
**4.8 times**  
(2.3-6.4)

Present, 1.1°C



will likely occur  
**8.6 times**  
(4.3-10.7)

1.5°C



will likely occur  
**13.9 times**  
(6.9-16.6)

2.0°C

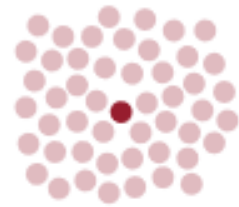
Future global warming



50-year event

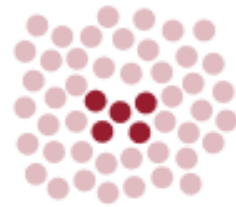
### Hot temperature extremes over land

Frequency of extreme temperature event that occurred once in 50 years on average in a climate without human influence



Once

1850–1900



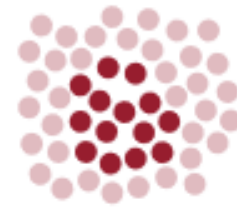
now likely to occur  
**4.8 times**  
(2.3-6.4)

Present, 1.1°C



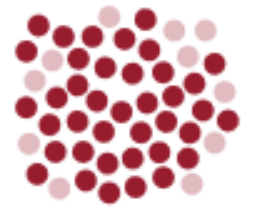
will likely occur  
**8.6 times**  
(4.3-10.7)

1.5°C



will likely occur  
**13.9 times**  
(6.9-16.6)

2.0°C



will likely occur  
**39.2 times**  
(27.0-41.4)

4.0°C

Future global warming levels



- Climate science research and communications NGO
- Policy neutral, strictly nonpartisan
- Highly localized tools & visuals on impacts & solutions
- Free!

[www.climatecentral.org](http://www.climatecentral.org)

**CLIMATE**



**CENTRAL**

- Climate Matters
- Climate Shift Index
- Coastal Risk Screening Tool

# CLIMATE MATTERS



LA AUTORIDAD EN EL TIEMPO

### CAMBIO CLIMÁTICO Y USO DEL AGUA

- INUNDACIONES**  
Contaminan el agua potable
- CALOR**  
Alimenta floraciones de algas, derrite nieve acumulada.
- SEQUÍA**  
Daña cultivos, seca el suministro

CLIMATE CO CENTRAL

**Brooke Brighton** @BrookeBrighton · Jun 21

Today, meteorologists across the country are spreading the word about #showyourstripes. The initiative aims to share a snapshot of climate change in your area & bring awareness regarding the topic. The background behind me shows the climate pattern in Wisconsin from 1895-2018.

WISCONSIN 2018  
CLIMATE CO CENTRAL



# MORE WARM SUMMER DAYS

## DAYS ABOVE NORMAL



Annual summer (June, July, August) days above 1991-2020 NCEI climate normal.  
Source: RCC-ACIS.org

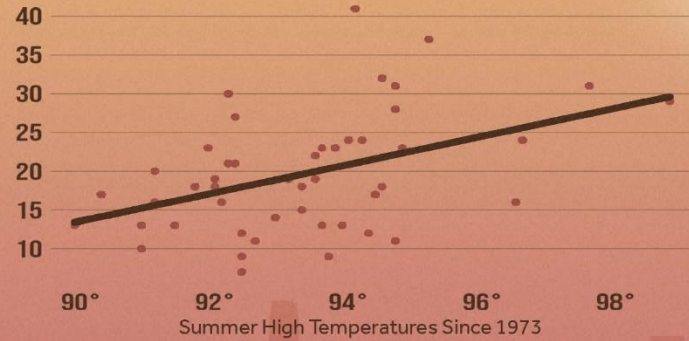
CLIMATE  CENTRAL

[www.climatecentral.org/climate-matters/2024-summer-package](http://www.climatecentral.org/climate-matters/2024-summer-package)



## Houston Higher Temps = More Stagnant Air

Stagnant Summer Days

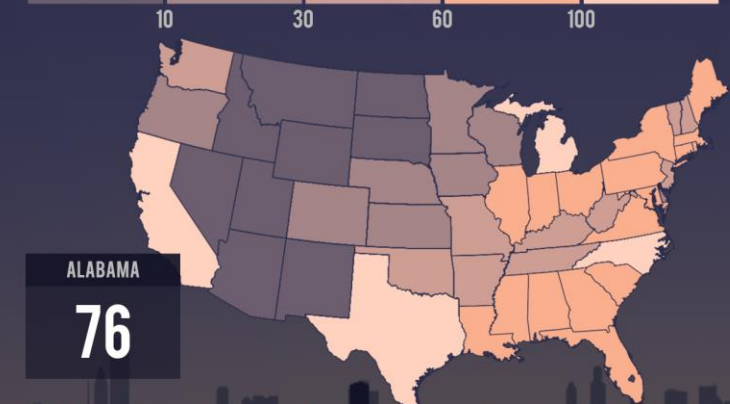


Annual average summer maximum temperature vs. summer stagnant days (1973-2021)  
Source: NOAA/NCEP Air Stagnation Index, RCC-ACIS.org

CLIMATE CENTRAL

## MAJOR U.S. POWER OUTAGES

WEATHER-RELATED, 2000-2023



Total weather-related major power outages in each state, 2000-2023.  
Number of outages affecting more than 50k customers or service of 300 megawatts.  
Source: US Department of Energy Form OE-417

CLIMATE CENTRAL

## MORE MOSQUITO DAYS

Annual days suitable for mosquitoes



Mosquito days: 50-95°F, relative humidity >42%  
Source: Yamana and Elrahir (2013); gridMET

CLIMATE CENTRAL

## OHIO Climate Friendly Homes Can Save:

Utility costs:

**\$673** per year

Emissions reductions:

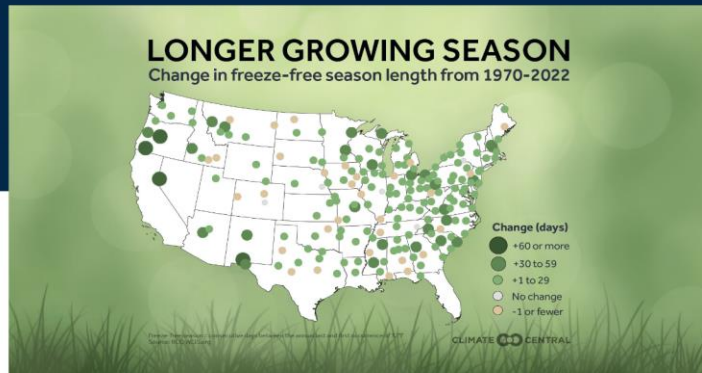
**3.1** tons of CO<sub>2</sub> equivalent per year



Savings per household  
Source: Wilson et al. 2017

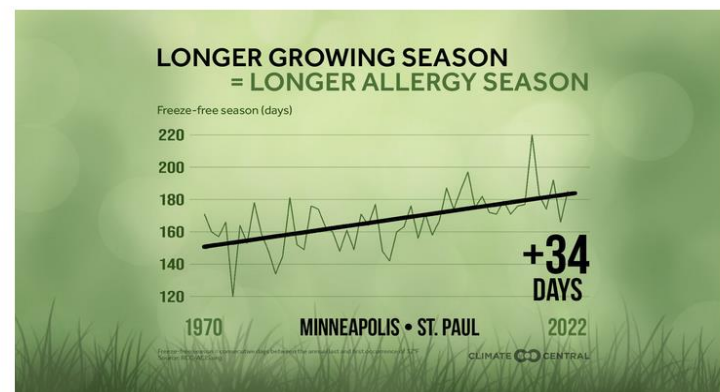
CLIMATE CENTRAL

# Allergy Season: Earlier, Longer, and Worse



## KEY CONCEPTS

- Plants are leafing and blooming earlier, and the overall growing season is lasting longer across much of the U.S.
- Analysis of temperature data for 203 U.S. cities shows the freeze-free season lengthened by more than two weeks (15 days) on average since 1970.
- For millions of Americans that suffer from seasonal allergies to pollen and mold, climate change is bringing an earlier, longer, and overall worse allergy season.
- Climate Central's new report *Seasonal Allergies: Pollen and Mold* details more of the weather and climate trends that are worsening allergy season and the associated health risks.



Click the downloadable graphic: Longer Growing Season

## Warming climate, longer pollen season, worse allergies

The first leaves and blooms of spring are arriving [days to weeks early in parts of the U.S.](#), according to the [USA National Phenology Network \(USA-NPN\)](#). Some areas in the East and South are seeing the earliest spring on record.

This is bad news for people with seasonal allergies—about one-quarter of adults (26%) and 19% of children in the U.S., according to the Centers for Disease Control and Prevention.

Earlier spring and longer periods of freeze-free days mean that plants have more time to flower and release allergy-inducing pollen. A [recent study](#) found that North American pollen seasons became longer (by 20 days on average) and more intense (21% increase in concentrations) from 1990 to 2018.

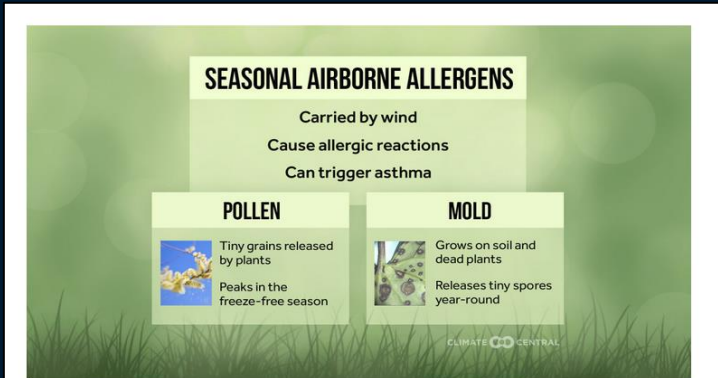
Seasonal allergies can already last from early spring through late fall. But warming temperatures and shifting seasonal patterns—both linked to climate change and greenhouse gas emissions—are expanding allergy season and its [impacts on respiratory health](#).

Climate Central's new report, *Seasonal Allergies: Pollen and Mold*, details weather and climate trends that affect allergy season locally.

## Longer growing season across the U.S.

To analyze how the [growing season](#) has changed in the U.S., Climate Central assessed temperature data for 203 cities since 1970.

- The freeze-free season lengthened across the country by more than two weeks (15 days) on average.
- 85% (172) of the cities saw their freeze-free seasons lengthen.
- In 31 cities, the season between the last and first freeze grew by at least a month.
- The growing season in Reno, Nev., increased by 99 days—among the biggest increases in the country.
- Since 1970, the freeze-free season lengthened the most in the West (27 days).
- The freeze-free season lengthened by more than two weeks in the Southeast (16 days), Northeast (15 days), and South (14 days).
- The Central region saw the freeze-free season lengthen by 13 days.



Click the downloadable graphic: Airborne Seasonal Allergens

## More than pollen: mold spores cause seasonal allergies, too.

Plant pollen typically peaks in spring, summer, or fall, depending on the species and location. This [video](#) from researchers at the University of Michigan shows how pollen season blooms across the U.S.

In addition to pollen, some molds (fungi that grow on soil and dead plants) can be allergenic. Different kinds of molds may release tiny spores throughout the year, but tend to peak in late summer and fall.

For people who have both pollen and mold allergies, this can mean allergies that last for much of the year. Although outdoor mold isn't as well-studied as pollen, climate change is likely affecting how both allergens impact people with allergies and asthma.

## Climate change is affecting allergy season in other ways.

Warming temperatures and more freeze-free days are key ways that climate change is affecting allergy season. But other connections between climate change and seasonal allergies are becoming clearer as research advances.

Climate Central's new report, *Seasonal Allergies: Pollen and Mold*, details weather and climate trends that affect allergy season locally—including how increased carbon dioxide in the atmosphere boosts pollen production, and why thunderstorms can increase the risk of asthma attacks.

## Newsletters & Alerts

Get the latest climate science news, research and solutions delivered straight to your inbox. Sign up for as many as you'd like.

✉ Email address

👤 First name

👤 Last name

Climate Connect Newsletter

See monthly highlights from Climate Central



Climate Matters

Weekly reporting resources for meteorologists, journalists, and other climate communicators



Realtime Climate

Timely notifications about local climate impacts and events



You can unsubscribe at any time. For more details, review our [privacy policy](#).

[www.climatecentral.org/list-signup](http://www.climatecentral.org/list-signup)

## Custom email signup

Get updates, media alerts, and climate reporting resources

Sign up →

# More on Solutions

Daily Newsletter:



~Weekly Podcast:



Peer-reviewed paper:

Five sensitive intervention points to  
achieve climate neutrality by 2050,  
illustrated by the UK

Jennifer L. Castle<sup>a b 1</sup>  , David F. Hendry<sup>b 1</sup>

[doi.org/10.1016/j.renene.2024.120445](https://doi.org/10.1016/j.renene.2024.120445)

# Key tools from Climate Central

- Climate Matters
- **Climate Shift Index**
- Coastal Risk Screening Tool



# Climate Shift Index<sup>®</sup> Global Map

City

Type a city name

Date

Today

Single date

Multi-day average

Select type of map:

Climate Shift Index

Advanced settings

Download

Sign climate data

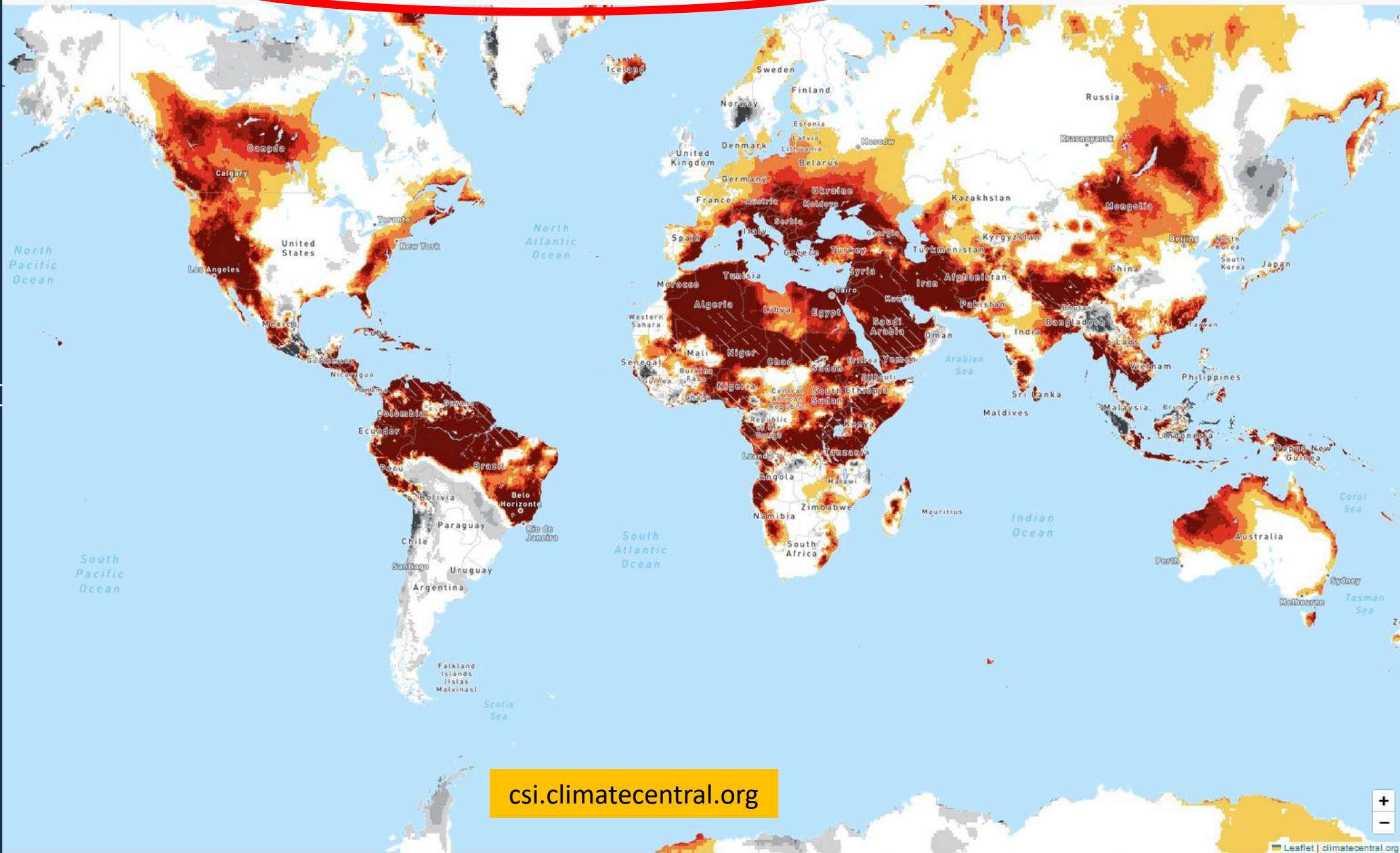
Based on NOAA data generated on 2024-07-09T18:00Z.

Climate Shift Index [Learn more](#)  
for average temperatures, Jul 10, 2024

Change in likelihood due to climate change



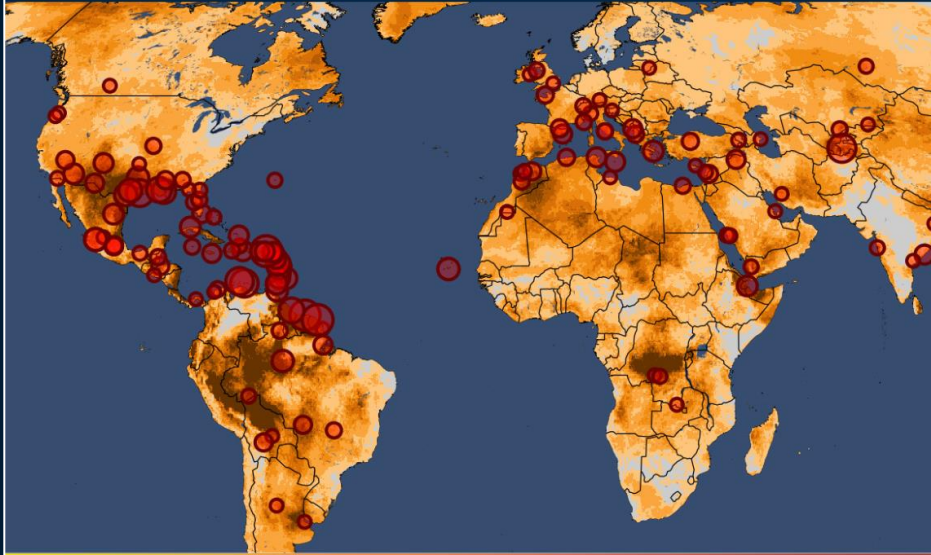
Statistical uncertainties



[csi.climatecentral.org](https://csi.climatecentral.org)

## The hottest 12-month stretch in recorded history

How carbon pollution affected countries and major cities worldwide from November 2022 to October 2023

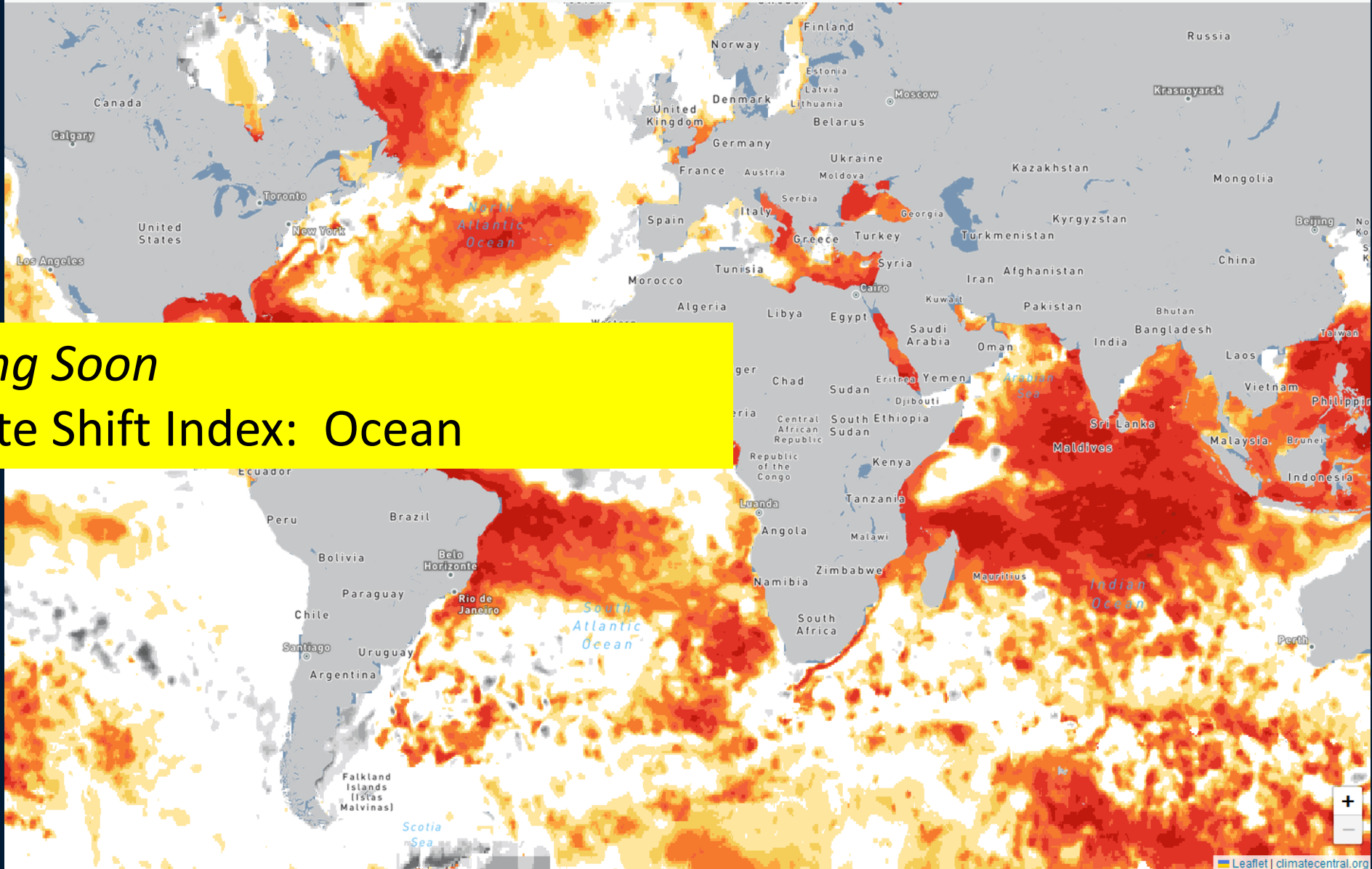
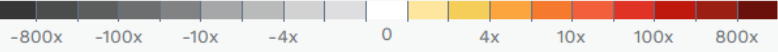


November 9, 2023

CLIMATE  CENTRAL

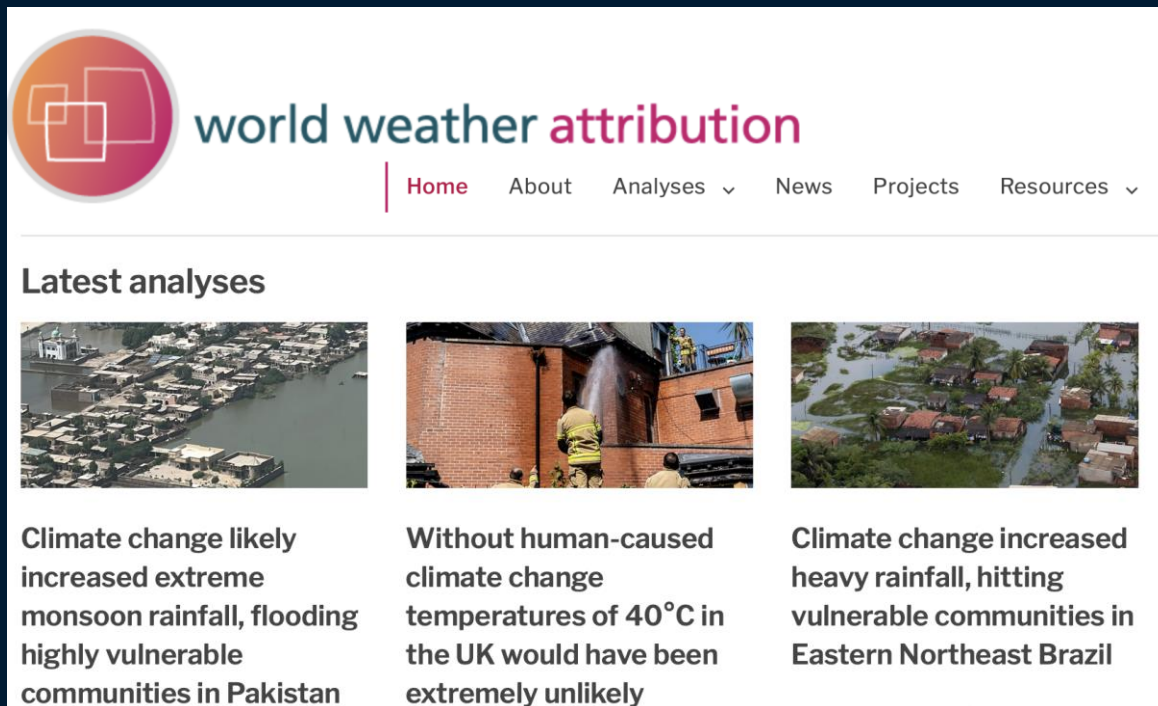
From November 2022 through October 2023, 5.8 billion people—73 percent of the global population—experienced 30+ days of abnormal heat made at least 3x more likely by climate change.





*Coming Soon*  
Climate Shift Index: Ocean

# Other attribution tools



The screenshot shows the homepage of the World Weather Attribution website. At the top left is a logo consisting of three overlapping squares in shades of orange and red. To the right of the logo is the text "world weather attribution" in a sans-serif font, with "world" in blue, "weather" in red, and "attribution" in blue. Below the logo and text is a navigation menu with the following items: "Home" (underlined), "About", "Analyses" (with a dropdown arrow), "News", "Projects", and "Resources" (with a dropdown arrow). Below the navigation menu is a section titled "Latest analyses" in bold. Under this section are three columns, each with a small image and a text block. The first column has an image of a flooded coastal town and the text: "Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan". The second column has an image of firefighters spraying water on a brick building and the text: "Without human-caused climate change temperatures of 40°C in the UK would have been extremely unlikely". The third column has an image of a flooded rural area with houses and the text: "Climate change increased heavy rainfall, hitting vulnerable communities in Eastern Northeast Brazil".

world weather attribution

Home About Analyses News Projects Resources

### Latest analyses

Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan

Without human-caused climate change temperatures of 40°C in the UK would have been extremely unlikely

Climate change increased heavy rainfall, hitting vulnerable communities in Eastern Northeast Brazil

[www.worldweatherattribution.org](http://www.worldweatherattribution.org)

## Climate Attribution Database

Climate attribution science plays a central role in climate litigation and policy-making. The science is central to legal debates on the causal links between human activities, global climate change, and impacts on human and natural systems. This database contains **687** scientific resources

[climateattribution.org](http://climateattribution.org)

# Key tools & programs

- Climate Matters
- Climate Shift Index
- Coastal Risk Screening Tool





### Time horizon

Explore sea level rise and coastal flood threats by decade.

[VIEW MAP](#)



### Water level

Choose a water level and see what areas may be impacted.

[VIEW MAP](#)



### Warming choices

Compare scenarios for long-term sea level rise based on different pollution pathways.

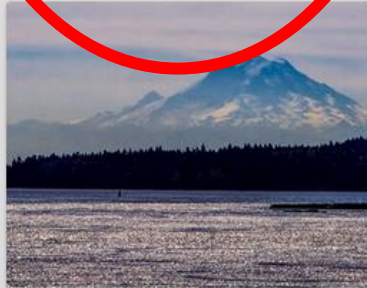
[VIEW MAP](#)



### Temperature

Explore how different warming scenarios could affect sea level rise in the coming decades.

[VIEW MAP](#)



### Elevation data

See how improved elevation data show a greater risk from sea level rise and coastal flooding.

[VIEW MAP](#)



### Ice sheets

Explore how ice loss in Antarctica and Greenland could impact different parts of the globe.

[VIEW MAP](#)



### Affordable housing

Explore how coastal flooding puts America's already scarce affordable housing at risk.

[VIEW STATS](#)



### Coastal wetlands

Explore how sea level rise, coastal development, and marsh vertical growth rates impact the resilience of wetlands.

[VIEW MAP](#) [VIEW STATS](#)





### COASTAL RISK SCREENING TOOL

## LAND PROJECTED TO BE BELOW ANNUAL FLOOD LEVEL IN 2030

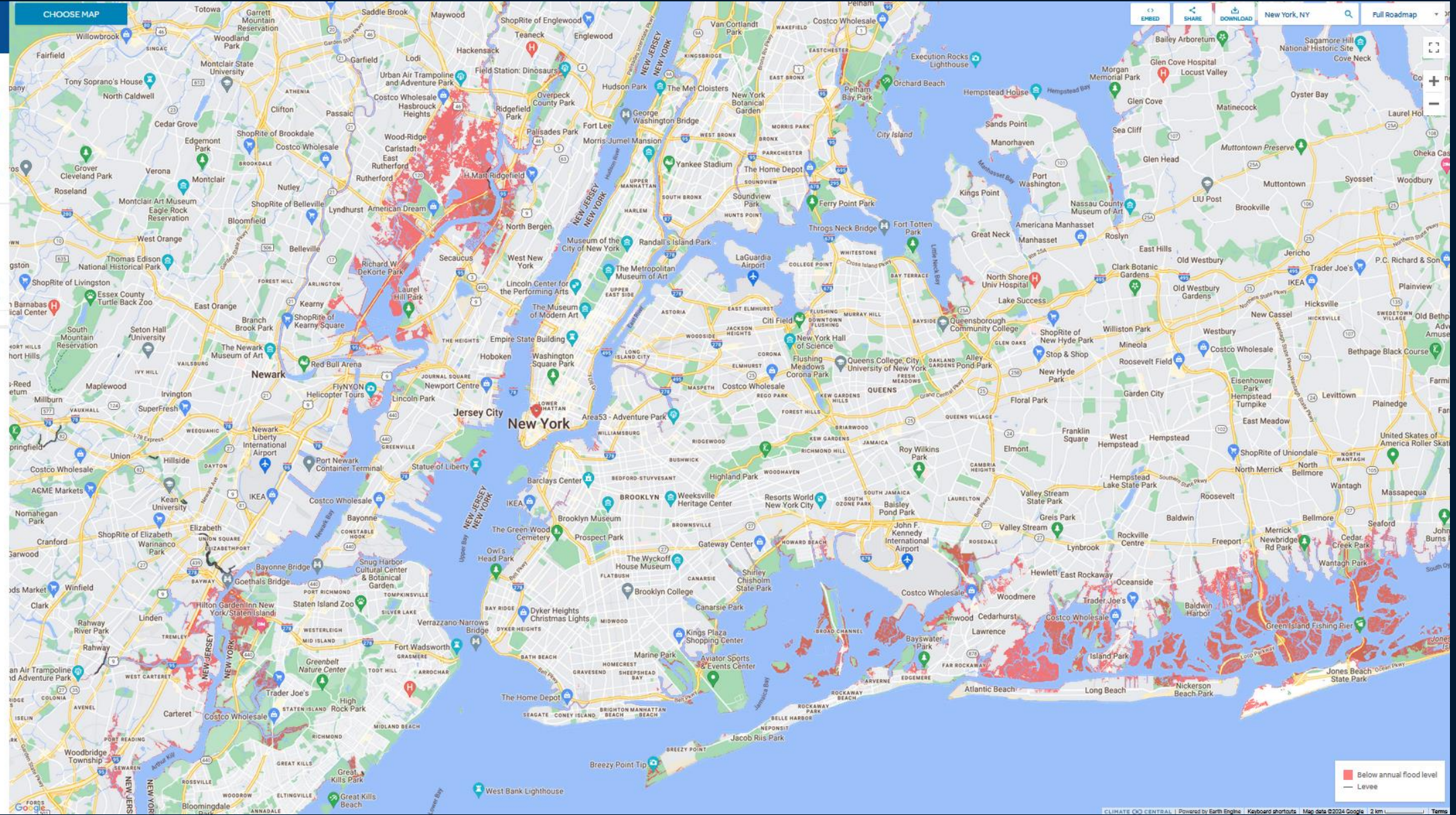
Explore sea level rise and coastal flood threats by adjusting the controls below.

[DETAILS AND LIMITATIONS](#)

YEAR  
2030

[CHANGE OTHER SETTINGS](#)

[Video Tutorial](#)







COASTAL RISK SCREENING TOOL

### LAND PROJECTED TO BE BELOW ANNUAL FLOOD LEVEL IN 2150

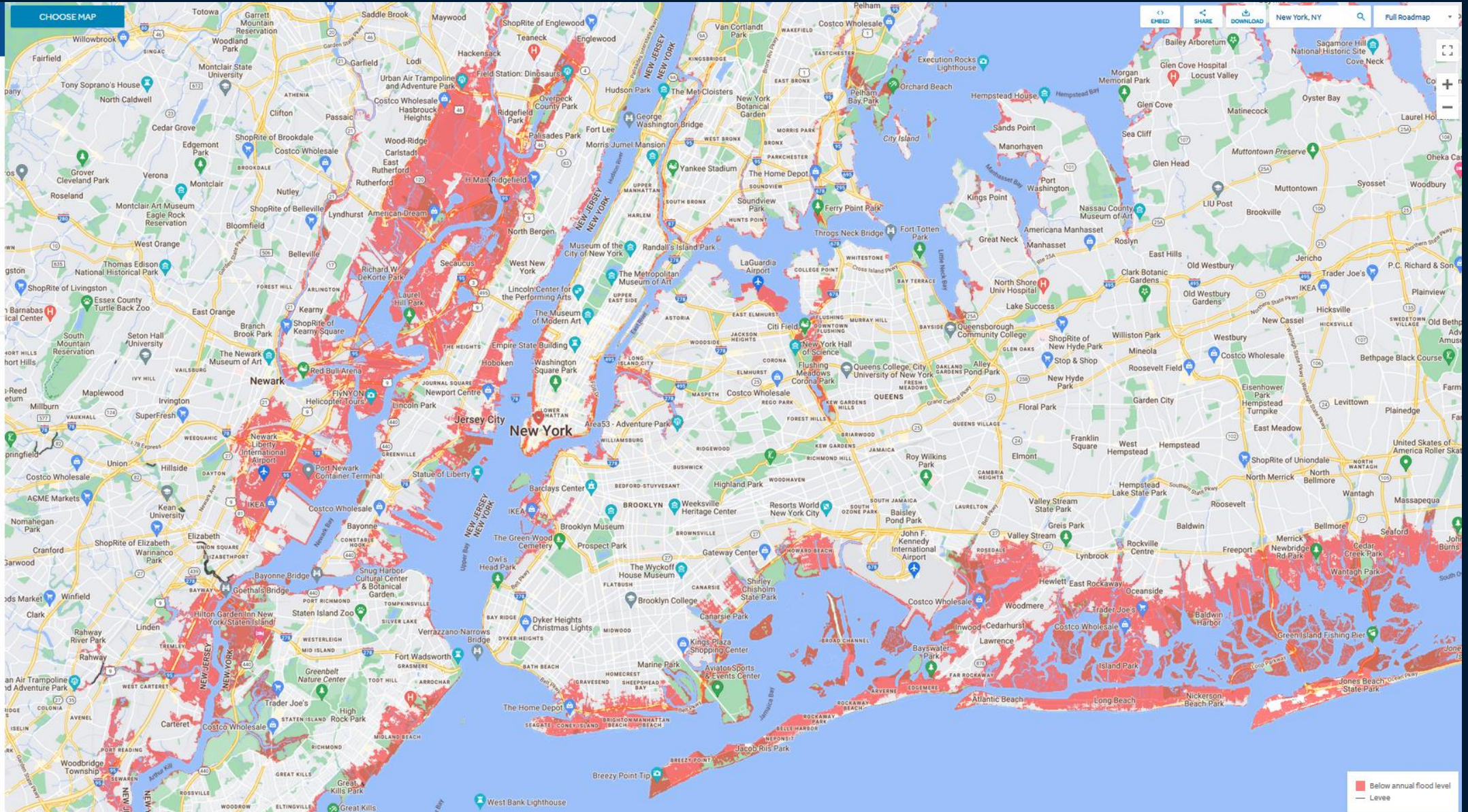
Explore sea level rise and coastal flood threats by adjusting the controls below.

[DETAILS AND LIMITATIONS](#)

YEAR  
2150

[CHANGE OTHER SETTINGS](#)

[Video Tutorial](#)







### COASTAL RISK SCREENING TOOL

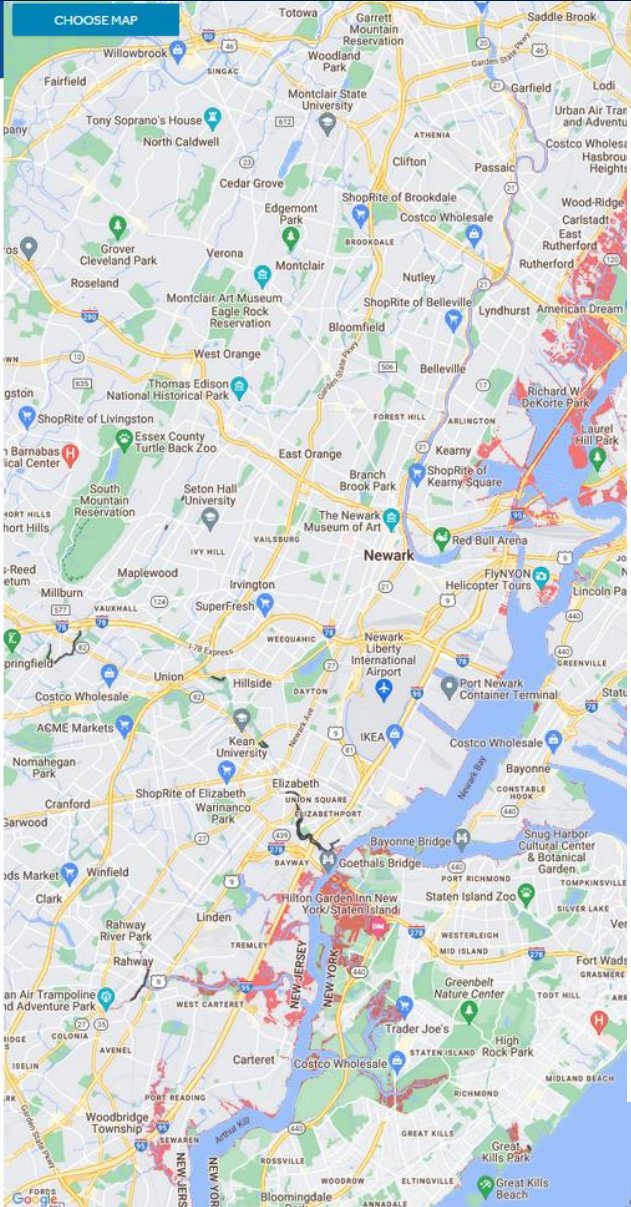
## LAND PROJECTED TO BE BELOW ANNUAL FLOOD LEVEL IN 2030

Explore sea level rise and coastal flood threats by adjusting the controls below.

[DETAILS AND LIMITATIONS](#)

YEAR  
2030

[CHANGE OTHER SETTINGS](#)



#### PROJECTION TYPE

sea level rise



#### POLLUTION PATHWAY OR SEA LEVEL SCENARIO

current trajectory



#### LUCK

medium



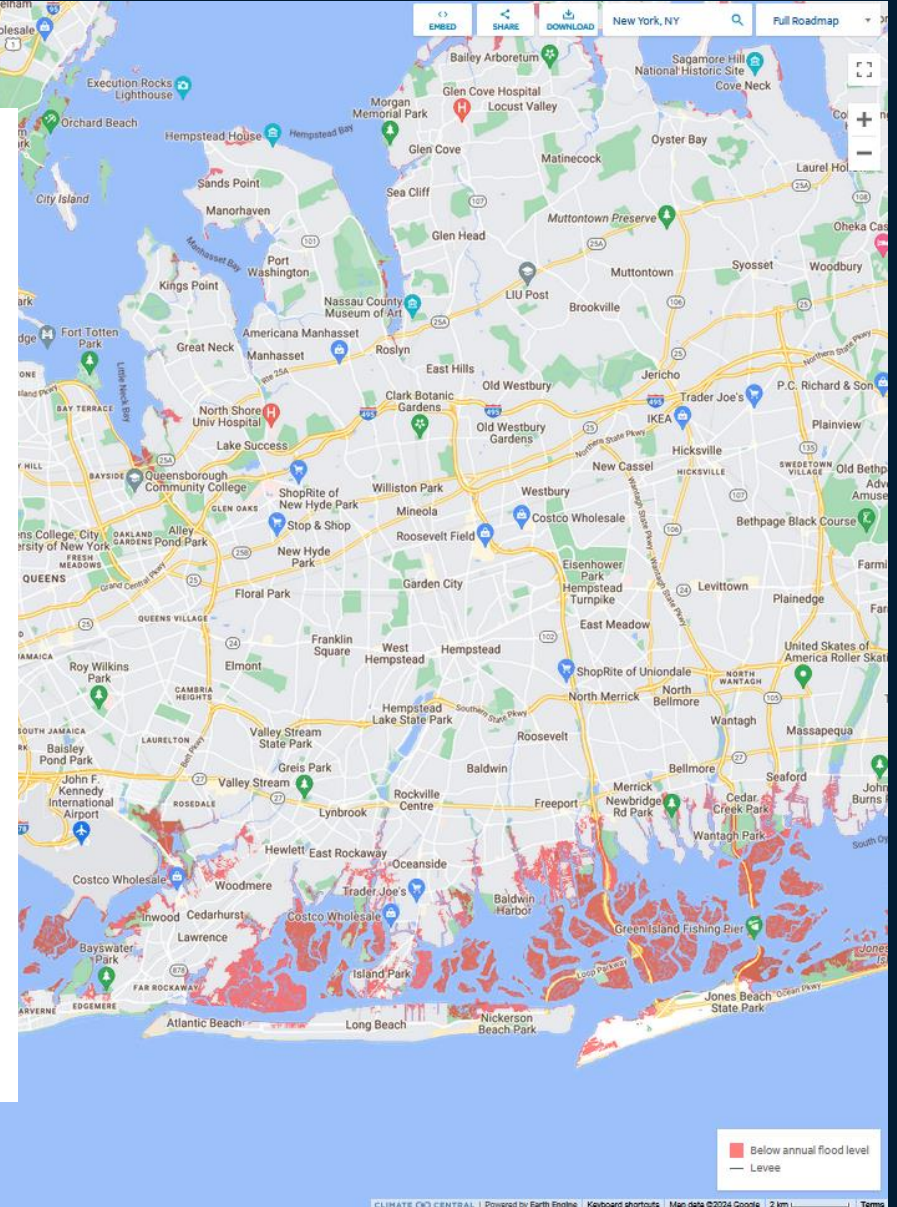
#### AREAS TO SHOW AS THREATENED

- All land below water level
- Exclude all potentially protected areas

#### SEA-LEVEL-PROJECTION SOURCE

- Leading Consensus (IPCC 2021)
- More Comprehensive and Less Certain (IPCC 2021)
- NOAA 2022 (U.S. only)
- Mid-range Legacy Projections (Kopp et al. 2014)
- Pessimistic Legacy Projections (Kopp et al. 2017)

DONE



# Mechanisms



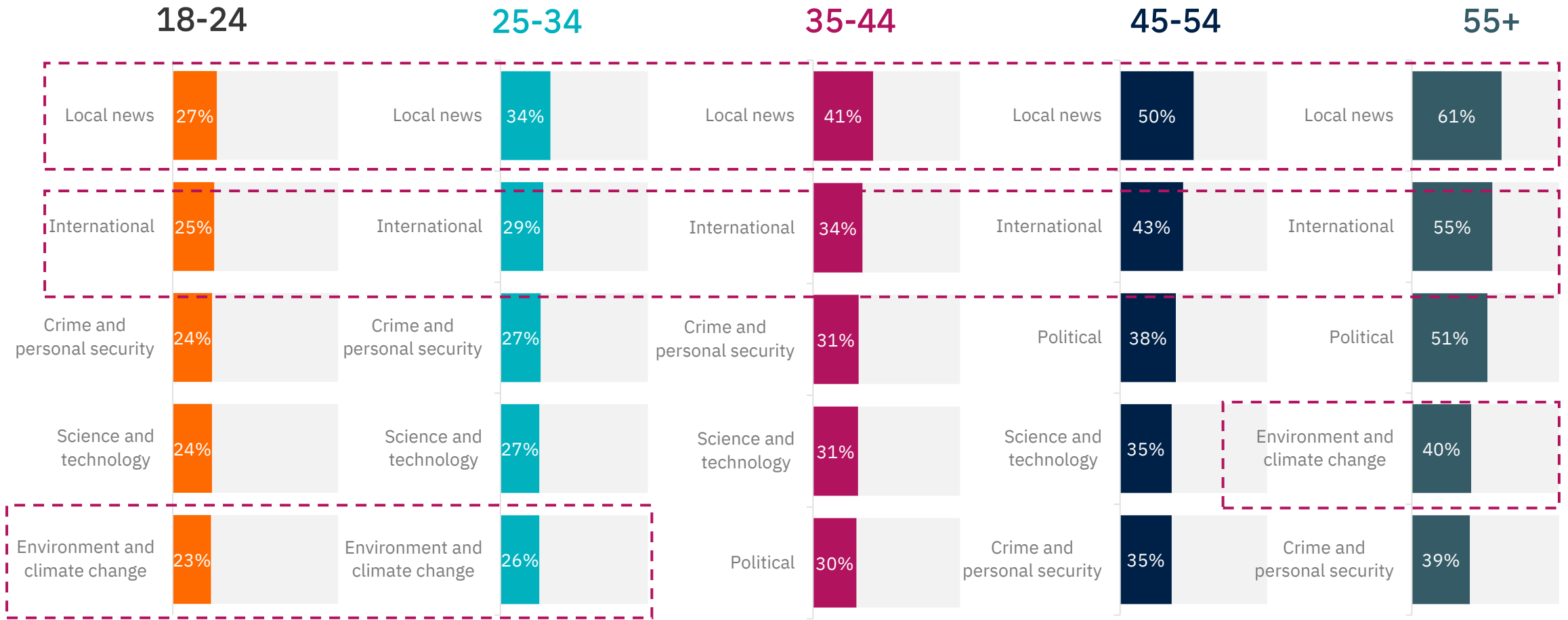
# Reuters Institute *Digital News Report* 2024

More information at  
[digitalnewsreport.org/2024](https://digitalnewsreport.org/2024)

[reutersinstitute.politics.ox.ac.uk/digital-news-report/2024](https://reutersinstitute.politics.ox.ac.uk/digital-news-report/2024)



# Types of news, by age – All countries



# UNITED STATES

Population **331m**  
Internet penetration **90%**

Digital News Report 2024 | United States

## WEEKLY REACH OFFLINE AND ONLINE

### TOP BRANDS

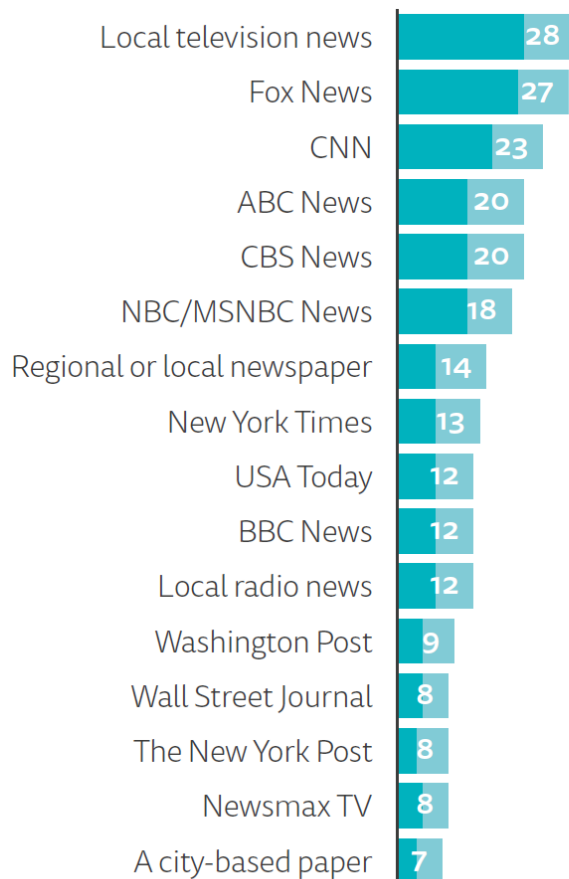
% Weekly usage

-  Weekly use TV, radio & print
-  More than 3 days per week TV, radio & print
-  Weekly use online brands
-  More than 3 days per week online brands

**22%**  
pay for  
**ONLINE NEWS**



## TV, RADIO, AND PRINT



## ONLINE

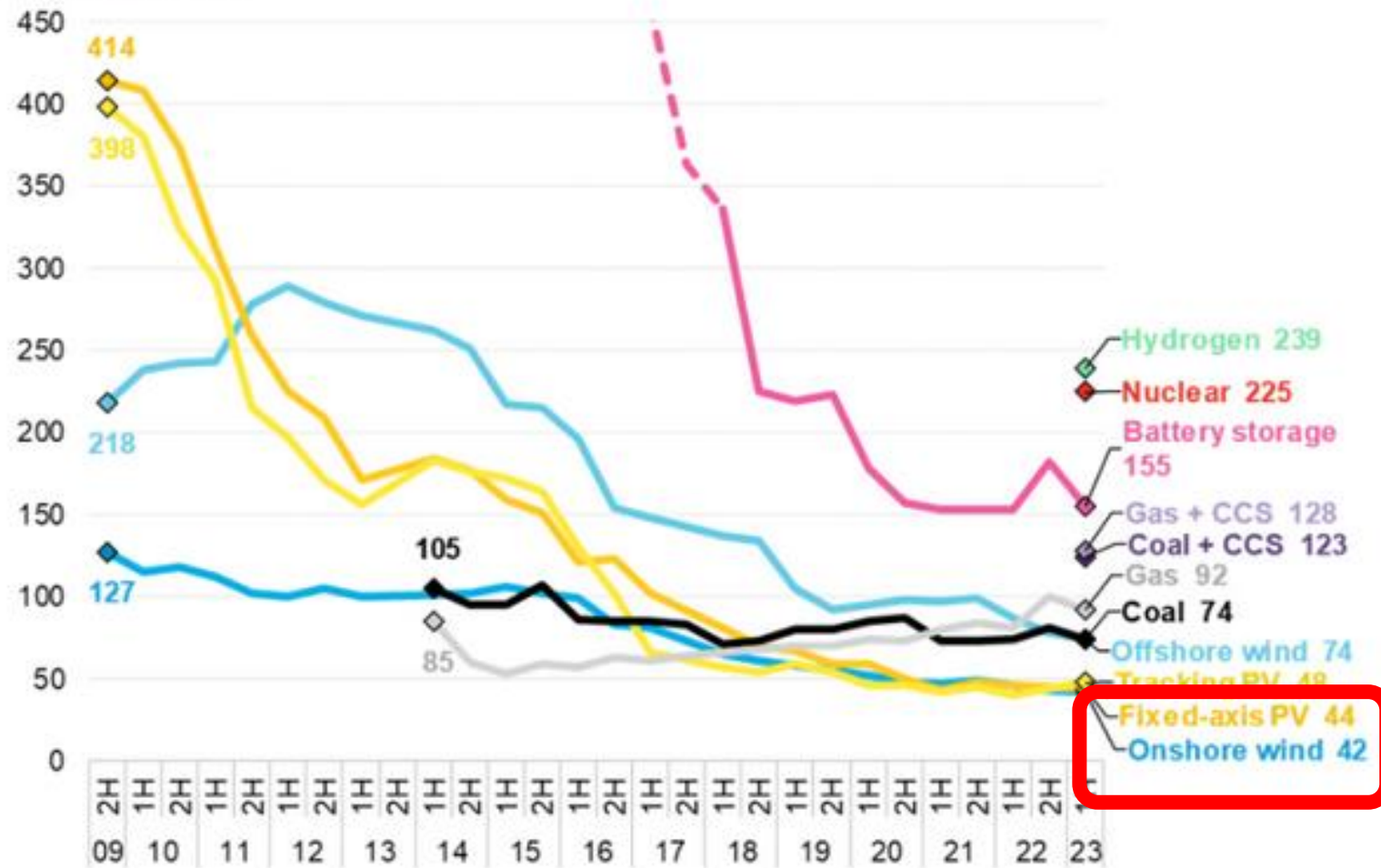




# There's hope

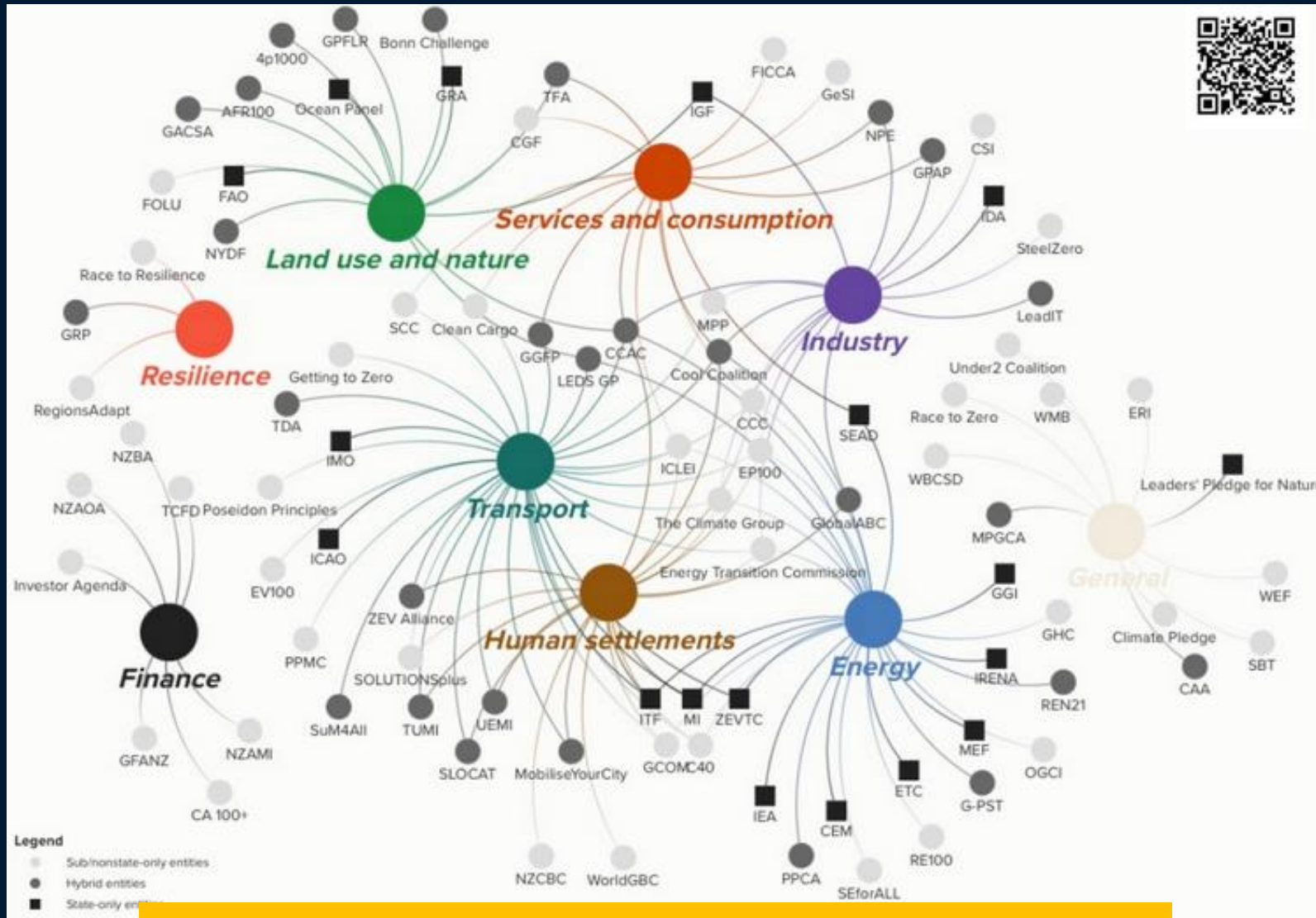
Figure 1: Global levelized cost of electricity benchmarks, 2009-2023

\$/MWh (real 2022)





# There's hope



[www.futureclimatecooperation.org/climate-action-ecosystem](http://www.futureclimatecooperation.org/climate-action-ecosystem)



# Communicating Climate Change

- Audience
- Messengers
- Messages
- Mechanisms

# Communicating Climate Change: Messengers, Messages, and Mechanisms

Karen Florini – Senior Advisor  
[kflorini@climatecentral.org](mailto:kflorini@climatecentral.org)

10 July 2024