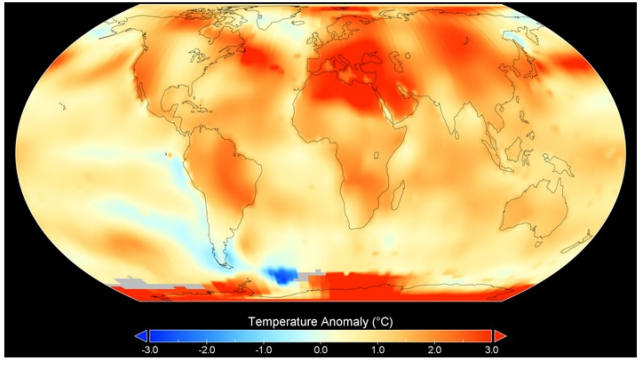
https://science.nasa.gov/climate-change/

VITAL SIGNS

Show All

Carbon Dioxide	Global Temperature	Methane	Arctic Sea Ice Minimum Extent	Ice Sheets	Sea Level	Ocean Warming
↑ 424 parts per million	↑ 1.4 °C since preindustrial	↑ 1922 parts per billion	↓ 12.2 percent per decade	↓ 406 billion metric tons per year	↑ 4 inches since January 1993	↑ 360 zettajoules since 1955

NASA, NOAA to Announce 2024 Global Temperatures, Climate Conditions

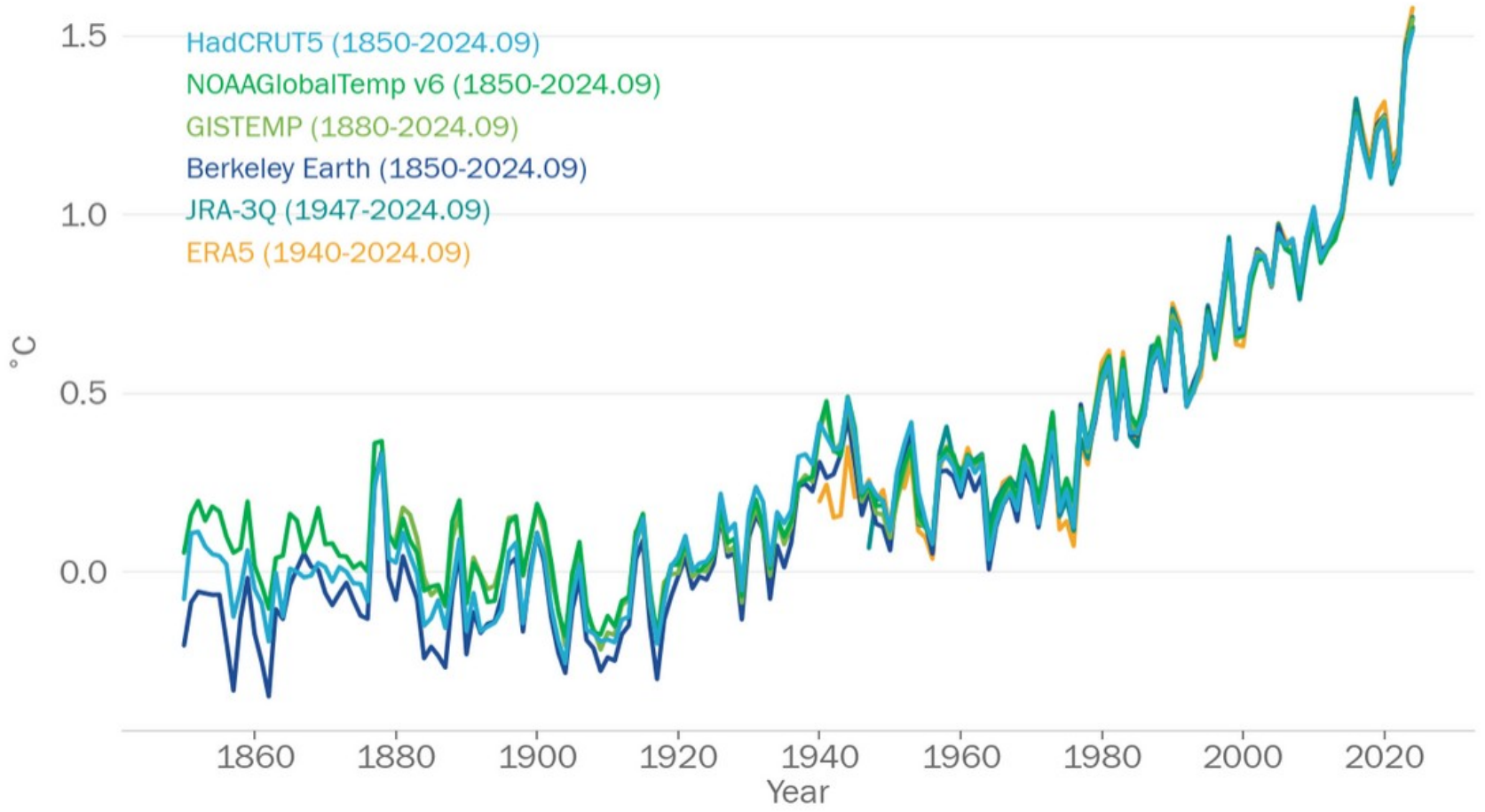


This map depicts global temperature anomalies for meteorological summer in 2024 (June, July, and August). It shows how much warmer or cooler different regions of Earth were compared to the baseline average from 1951 to 1980. (Credit: NASA/NOAA)

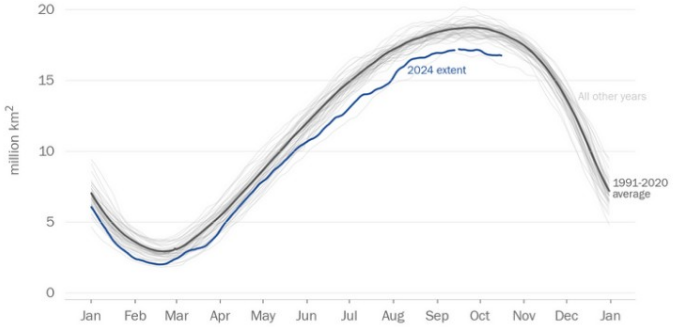
Climate researchers from NASA and NOAA (National Oceanic and Atmospheric Administration) will release their annual assessments of global temperatures and discuss the major climate trends of 2024 during a media briefing at 12 p.m. EST Friday, Jan. 10.

NASA will share the briefing on the agency's website at: https://www.nasa.gov/live.

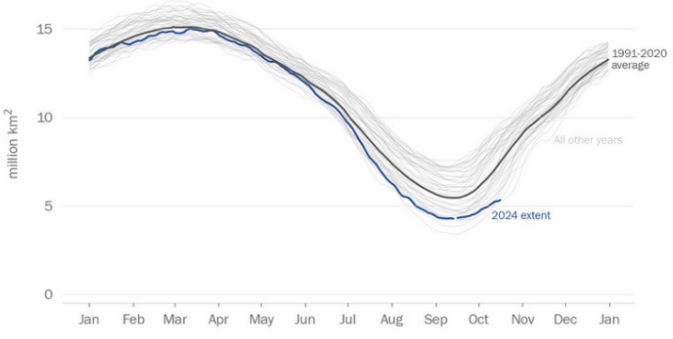
Preliminary estimate of the global mean temperature anomaly for 2024 - WMO



Antarctic and Arctic sea ice extent in 2024 have both been well below average.



Antarctic sea-ice extent reached its annual minimum of 2.0 million km^2 on 20 February, the second lowest extent in the satellite record (1979-2024), the lowest being in 2023. The annual maximum Antarctic sea-ice extent was reached around 19 September, with an extent of 17.2 million km^2 . The 2024 maximum is the second lowest extent in the satellite record, the lowest being in 2023.



Arctic sea-ice extent reached its annual maximum of 15.01 million km^2 on 14 March, slightly below the long-term average (1991-2020) of 15.2 million km^2. On 11 September, Arctic sea-ice likely reached its annual minimum extent of 4.3 million km^2. The 2024 minimum is the seventh lowest in the satellite record.

Figure 3: Daily Antarctic (top) and Arctic (bottom) sea ice extents in 2024 compared to the average and historical records since 1978. Source: National Snow and Ice Data Center

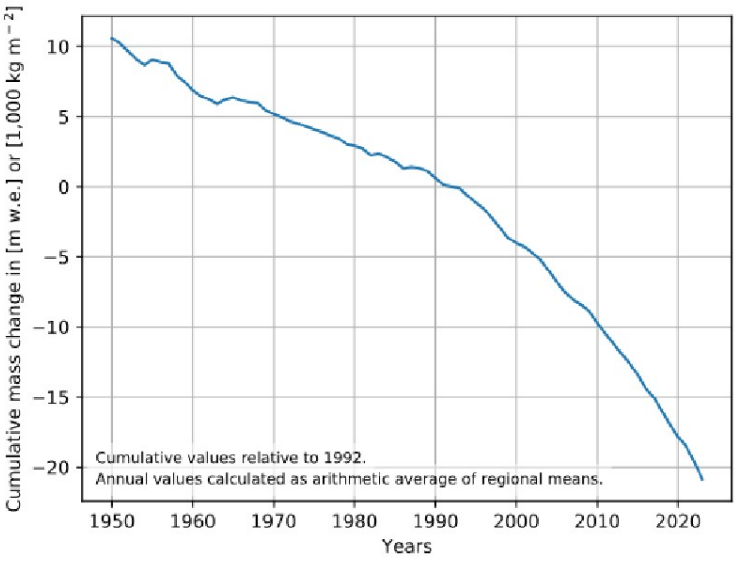


Figure 4: Global cumulative mass change of reference glaciers since 1950. 0 = 1992. Shown in meter water equivalent. Source: World Glacier Monitoring Service.

Glacier loss is accelerating. In 2023, glaciers lost an observed record 1.2 meter water equivalent of ice.

That's approximately 5 times as much water as there is in the Dead Sea.

For the hydrological year 2022/2023 data from a set of reference glaciers monitored by the World Glacier Monitoring Service (WGMS) indicate a global annual mass balance of -1.2 m of water equivalent. This is nominally the largest loss of ice on record (1950-2023), driven by an extremely negative balance in both western North America and Europe. The glacier mass loss in 2022/2023 corresponds to a volume of water discharged by the Amazon River in about one month, or approximately 5 times as much water as there is in the Dead Sea. In Switzerland, glaciers have lost about 10% of their remaining volume in 2021/2022 and 2022/2023.

About 90% of the energy that has accumulated in the Earth system is stored in the ocean. As energy has accumulated in the ocean, it has warmed, and global ocean heat content has increased.

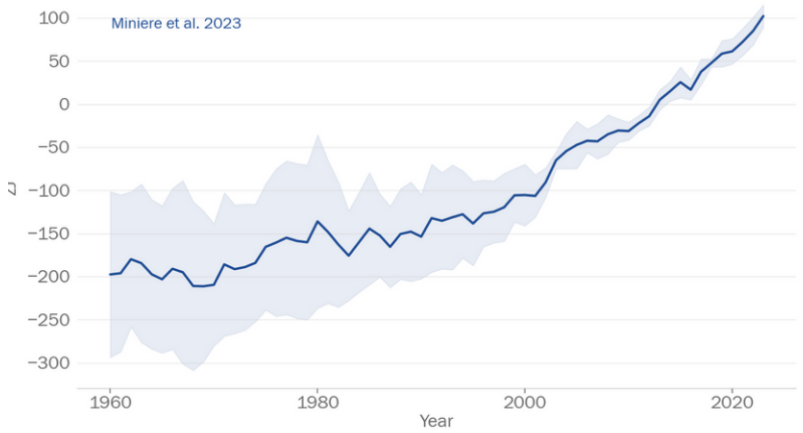


Figure 5: Ocean heat content from 1960-2023, shown as a difference from the 2005-2020 average: Source: Miniere et al. 2023.

Ocean heat content in 2023 was the highest on record. Preliminary data show 2024 has continued at comparable levels.

18X

The ocean absorbed around 3.1 million TWh of heat in 2023, 18x the world's total energy consumption.

It is expected that ocean warming will continue – a change that is irreversible on centennial to millennial timescales. Ocean heat content in 2023 was the highest annual value on record, exceeding the 2022 value by 13 ± 9 ZJ. Preliminary data from the early months of 2024 indicate that ocean heat content this year has continued at levels comparable to those seen in 2023. Ocean warming rates show a particularly strong increase in the past two decades. The rate of ocean warming for the 0–2 000 m layer was 0.7 ± 0.1 W m-2 from 1971 to 2023 on average, but 1.0 ± 0.1 W m-2 from 2005 to 2023. This rate corresponds to an average absorption of approximately 3.1 million terawatt-hours (TWh) of heat each year from 2005-2023, more than 18 times the world's energy consumption in 2023.

As water warms, it expands. This thermal expansion, combined with the melting of glaciers and ice sheets, contribute to sea level rise.

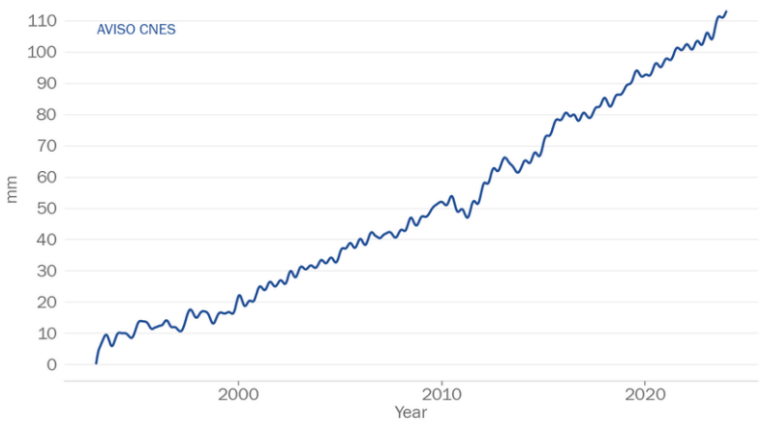


Figure 6: Global mean sea level from 1993-2023: Source: AVISO CNES

Sea level rise is accelerating. From 2014-2023, global mean sea level rose at a rate of 4.77 mm per year.

2X

That's more than double the rate from 1993-2002 (2.13 mm/yr).

The long-term rate of sea-level rise has more than doubled since the start of the satellite record, increasing from 2.13 mm yr-1 between 1993 and 2002 to 4.77 mm yr-1 between 2014 and 2023. This reflects continued ocean warming and thermal expansion, as well as the melting of glaciers and ice sheets. 2023 set a new observational record for annual global mean sea level with a rapid rise probably driven largely by El Niño. Preliminary 2024 data shows that the global mean sea level has fallen back to levels consistent with the rising trend from 2014 to 2022, following the declining El Niño in the first half of 2024. This will be reported on in the annual State of the Global Climate 2024 report to be produced around March 2025.

Below average precipitation

amounts were observed in northern and central South America, Northwest Africa as well as central southern Africa, Northwest and Northeast North America, Southeast Europe, northern Asia and on Pacific Islands .

Unusually high precipitation

was recorded in the Sahel region, around the Greater Horn of Africa and parts of eastern Africa. Furthermore, some spots at the eastern coast of South America, some of the Caribbean Islands, and some spots in North America received exceptional more rain than on the long-term mean. An unusual high precipitation excess was also recorded on the Arabian Peninsula, the Indian Monsoon region as well as western and central Asia. The Maritime Continent as well as northern and Central Australia received more than usual rainfall totals. Abnormal high precipitation totals were also recorded in Central and southwestern Europe.

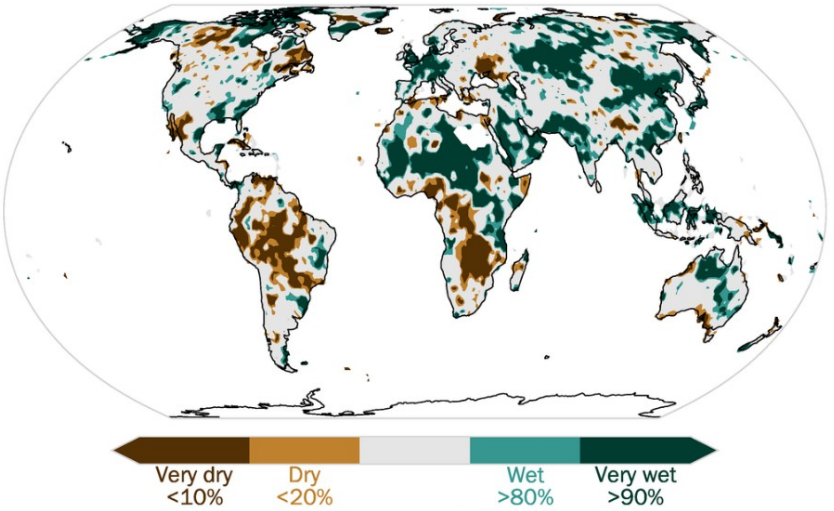


Figure 7: Precipitation worldwide from January to September 2024, relative to precipitation totals from 1991 to 2020. Source: GPCC

Extreme precipitation events

While the departure from the annual averages provides a global distribution pattern, extreme precipitation events are usually recorded at daily-to-monthly timescales. They are associated with heavy rain events that might lead to floods. Some of these extreme precipitation events are depicted on the map in the Extreme Events section below.

Global rivers experience driest year in over three decades

The 2023 State of Global Water Resources report (WMO, 2024b) provides a quantitative overview of the status of various components of the global water cycle--such as river flow, groundwater, soil moisture, snow and ice, lakes and reservoirs. The report reveals that 2023 was the driest year for global rivers in over three decades, coinciding with record-high observed temperatures (WMO, 2024c). The last five years have seen some of the lowest percentages of areas under normal river flow conditions, with reservoir inflows following a similar pattern, further reducing water availability for communities and ecosystems. Despite the dominance of dryness globally, flooding in connection with extreme precipitation events continued to induce severe loss and damage in many places of the world. Despite improvements in the availability and accessibility of in-situ data shared by WMO Members, significant gaps remain, particularly in Africa, South America, and Asia. The report underscores the potential of satellite-based observations and modeling systems to assist countries, especially those with limited monitoring capabilities, and large data gaps, to address these challenges and improve hydrological data collection.

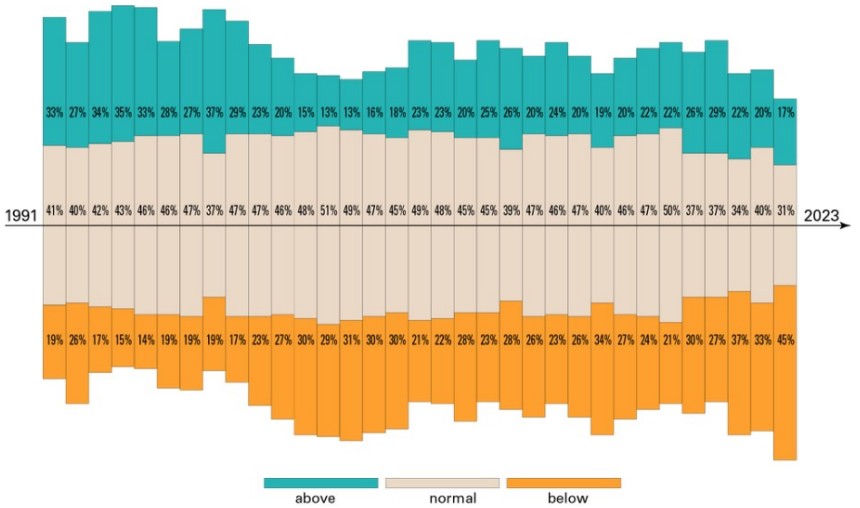
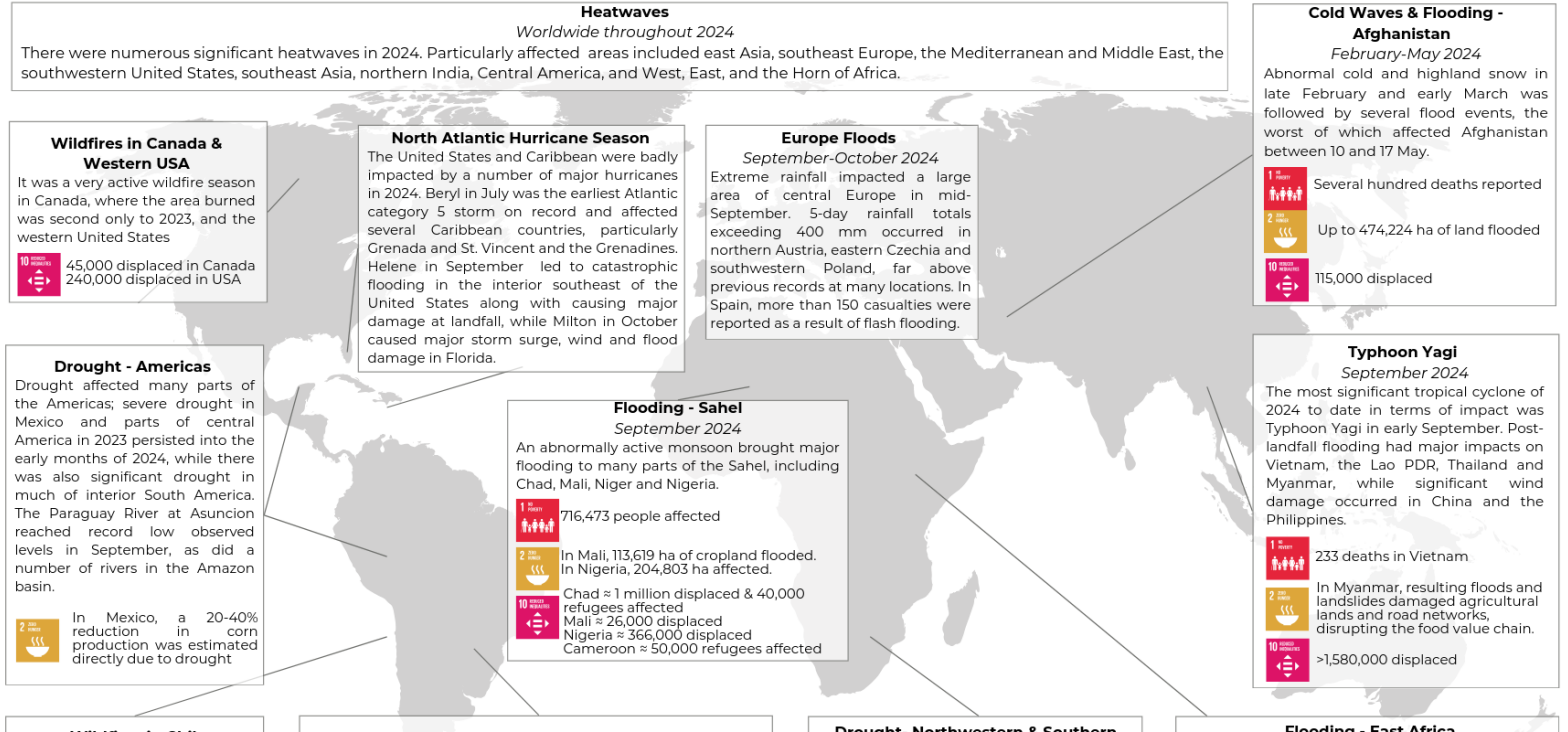


Figure 8: River River discharge condition distribution from 1991-2023.
Note: 7% of the area has no data. Source: WMO, 2024 (in press)

Extreme events led to extensive damage worldwide

Droughts, floods, tropical cyclones, heatwaves, and cold waves cause significant damage, loss of life, and hinder sustainable development. The map below highlights some of the most notable events from January to September 2024, with data on impacts collected from various UN agencies. Although many areas of development are affected by extremes, SDGs 1, 2 and 10 were chosen for this summary due to the timely availability of data from UN partners.



Heatwaves
Worldwide throughout 2024
There were numerous significant heatwaves in 2024. Particularly affected areas included east Asia, southeast Europe, the Mediterranean and Middle East, the southwestern United States, southeast Asia, northern India, Central America, and West, East, and the Horn of Africa.

Wildfires in Canada & Western USA
It was a very active wildfire season in Canada, where the area burned was second only to 2023, and the western United States

45,000 displaced in Canada
240,000 displaced in USA

North Atlantic Hurricane Season
The United States and Caribbean were badly impacted by a number of major hurricanes in 2024. Beryl in July was the earliest Atlantic category 5 storm on record and affected several Caribbean countries, particularly Grenada and St. Vincent and the Grenadines. Helene in September led to catastrophic flooding in the interior southeast of the United States along with causing major damage at landfall, while Milton in October caused major storm surge, wind and flood damage in Florida.

Europe Floods
September-October 2024
Extreme rainfall impacted a large area of central Europe in mid-September. 5-day rainfall totals exceeding 400 mm occurred in northern Austria, eastern Czechia and southwestern Poland, far above previous records at many locations. In Spain, more than 150 casualties were reported as a result of flash flooding.

Cold Waves & Flooding - Afghanistan
February-May 2024
Abnormal cold and highland snow in late February and early March was followed by several flood events, the worst of which affected Afghanistan between 10 and 17 May.

Several hundred deaths reported
Up to 474,224 ha of land flooded
115,000 displaced

Drought - Americas
Drought affected many parts of the Americas; severe drought in Mexico and parts of central America in 2023 persisted into the early months of 2024, while there was also significant drought in much of interior South America. The Paraguay River at Asuncion reached record low observed levels in September, as did a number of rivers in the Amazon basin.

In Mexico, a 20-40% reduction in corn production was estimated directly due to drought

Flooding - Sahel
September 2024
An abnormally active monsoon brought major flooding to many parts of the Sahel, including Chad, Mali, Niger and Nigeria.

716,473 people affected
In Mali, 113,619 ha of cropland flooded.
In Nigeria, 204,803 ha affected.
Chad ≈ 1 million displaced & 40,000 refugees affected
Mali ≈ 26,000 displaced
Nigeria ≈ 366,000 displaced
Cameroon ≈ 50,000 refugees affected

Typhoon Yagi
September 2024
The most significant tropical cyclone of 2024 to date in terms of impact was Typhoon Yagi in early September. Post-landfall flooding had major impacts on Vietnam, the Lao PDR, Thailand and Myanmar, while significant wind damage occurred in China and the Philippines.

233 deaths in Vietnam
In Myanmar, resulting floods and landslides damaged agricultural lands and road networks, disrupting the food value chain.
>1,580,000 displaced

Wildfires in Chile
2-3 February 2024
A fire around the city of Vina del Mar on 2-3 February resulted in over 14,000 properties affected, amongst the worst losses in a global wildfire this century.

>130 deaths
40,000 affected
>3000 displaced

Flooding - Brazil
May 2024
Persistent heavy rainfall in Rio Grande do Sul state of southern Brazil resulted in flooding which inundated large parts of the city of Porto Alegre and many surrounding areas. Economic losses of several billion US dollars were reported.

>180 deaths
2.3 million affected
Impacts on storage and transport had negative effects on rice commercialization. Artisanal fishing activities along the Patos Lagoon, were particularly affected.
630,000 displaced

Drought- Northwestern & Southern Africa
Early 2024
Dry conditions in what is usually the wet season in late 2023 and early 2024 resulted in significant drought in northwestern Africa and many parts of interior southern Africa. Combined with conflict, this led to a surge in displacement, disease outbreaks and food shortages

In Zambia, cereal production is estimated to have fallen by 42 % in 2024 compared to the previous five-year average.

Flooding - East Africa
March-May *2024*
Floods impacted equatorial east Africa, with major loss of life in countries including Kenya and Tanzania, and Lake Victoria reaching record high observed levels.

>11,000 livestock deaths >25,000 ha of cropland destroyed in Kenya.
≈ 3.4 million people facing severe acute food insecurity in Somalia.
Intensified severe acute food insecurity ≈ 15.8 million people in Ethiopia.
500,000 displaced across Somalia, Burundi, Tanzania and Kenya.

Highlights on socioeconomic impacts from UN agencies

Food Security
Input provided by FAO

- The compounded effect of shocks, such as intensifying conflict, El Niño-induced drought and high domestic food prices drove worsening food crises in 18 countries by mid-2024. In Nigeria, Sudan, Myanmar, Ethiopia, Zimbabwe, Malawi, Chad and Yemen all had at least 1 million more people facing high levels of acute food insecurity than during the 2023 peak.
- Global hunger levels rose sharply from 2019 to 2021 and persisted at the same level in 2023.
- Africa had the highest prevalence of undernourishment (PoU) in 2023 (20.4%), with even higher levels (about 30%) along middle and eastern Africa.
- The reduced cereal harvest across the globe is the result of a widespread El Niño linked drought that caused crop failures, steep declines in yields and reductions in harvested areas.

Migration & Displacement
Joint input by IOM, UNHCR & IDMC

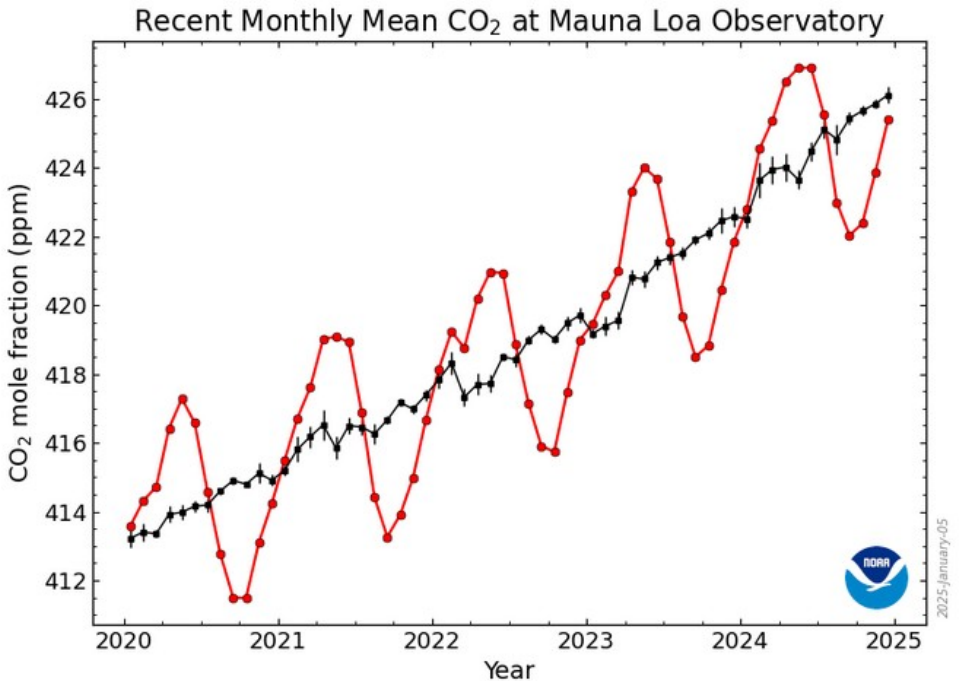
Extreme weather events in the first half of 2024, including flooding, droughts, cyclones, typhoons, and hurricanes have led to new, onward and protracted displacement of significant numbers of people in diverse places across the globe. Alongside the destruction of homes, critical infrastructure, forests, farmland and biodiversity loss, such extreme weather events undermine resilience and pose significant protection risks to people on the move and those already living in displacement – who are often excluded from national preparedness and response plans.

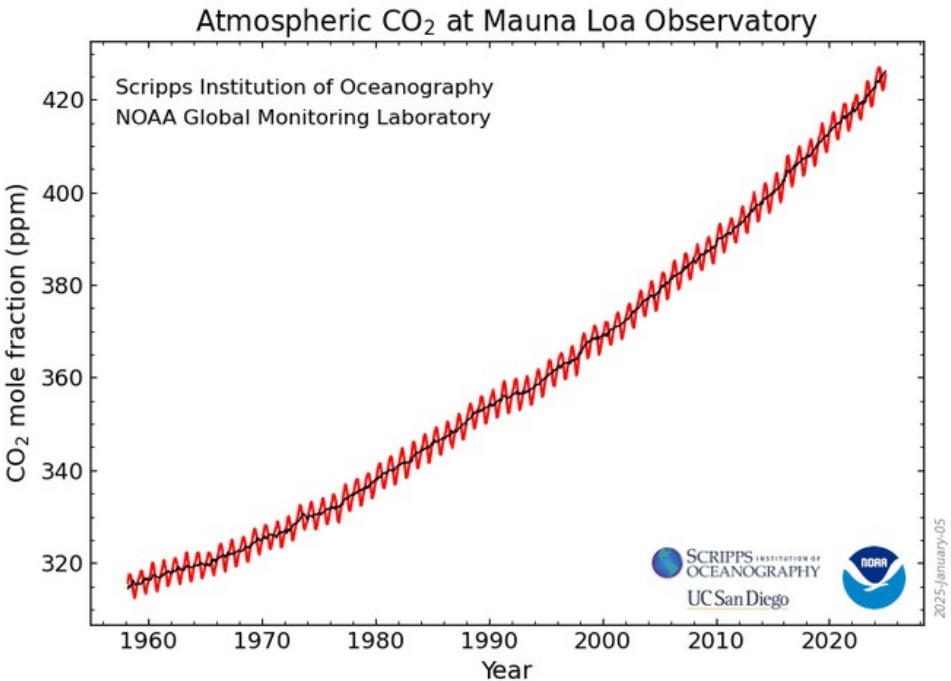
Monthly Average Mauna Loa CO_2

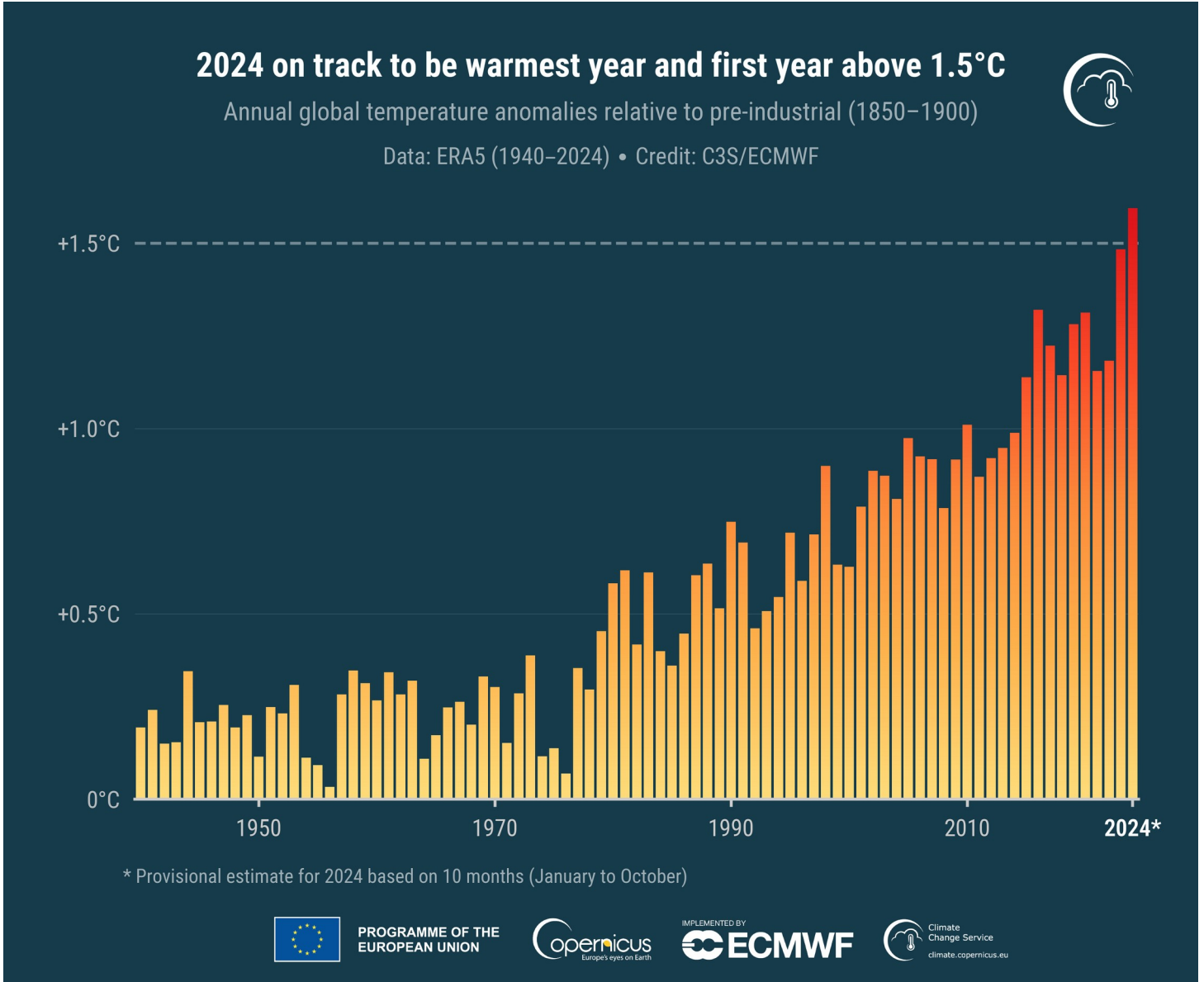
December 2024: 425.40 ppm

December 2023: 421.86 ppm

Last updated: Jan 05, 2025

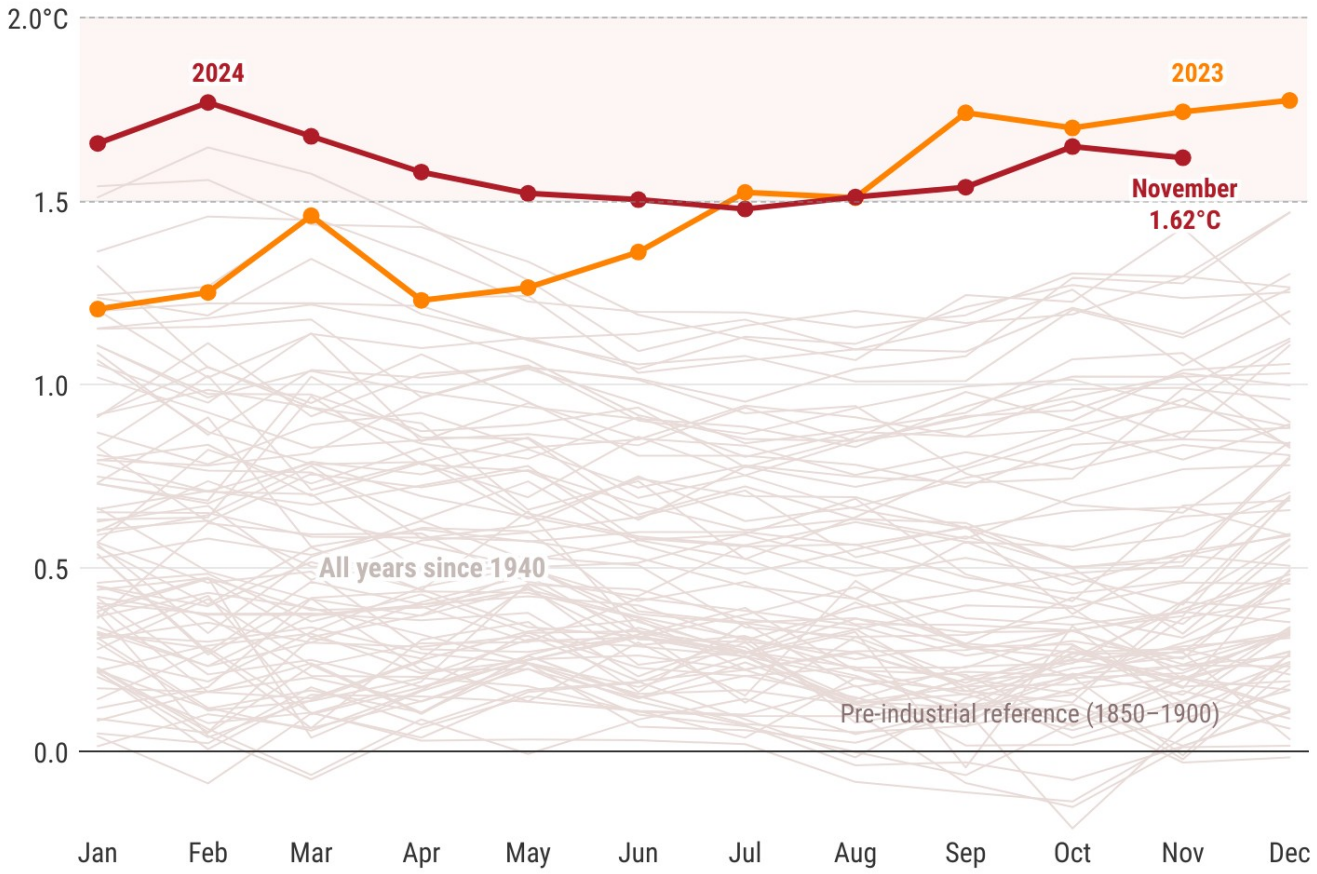





2024 on track to be warmest year and first year above 1.5°C
Annual global temperature anomalies relative to pre-industrial (1850–1900)
Data: ERA5 (1940–2024) • Credit: C3S/ECMWF
+1.5°C
+1.0°C
+0.5°C
0°C
1950
1970
1990
2010
2024*
* Provisional estimate for 2024 based on 10 months (January to October)
PROGRAMME OF THE EUROPEAN UNION
Copernicus
Europe's eyes on Earth
IMPLEMENTED BY
ECMWF
Climate Change Service
climate.copernicus.eu

Monthly global surface air temperature anomalies

Data source: ERA5 • Reference period: pre-industrial (1850–1900) • Credit: C3S/ECMWF

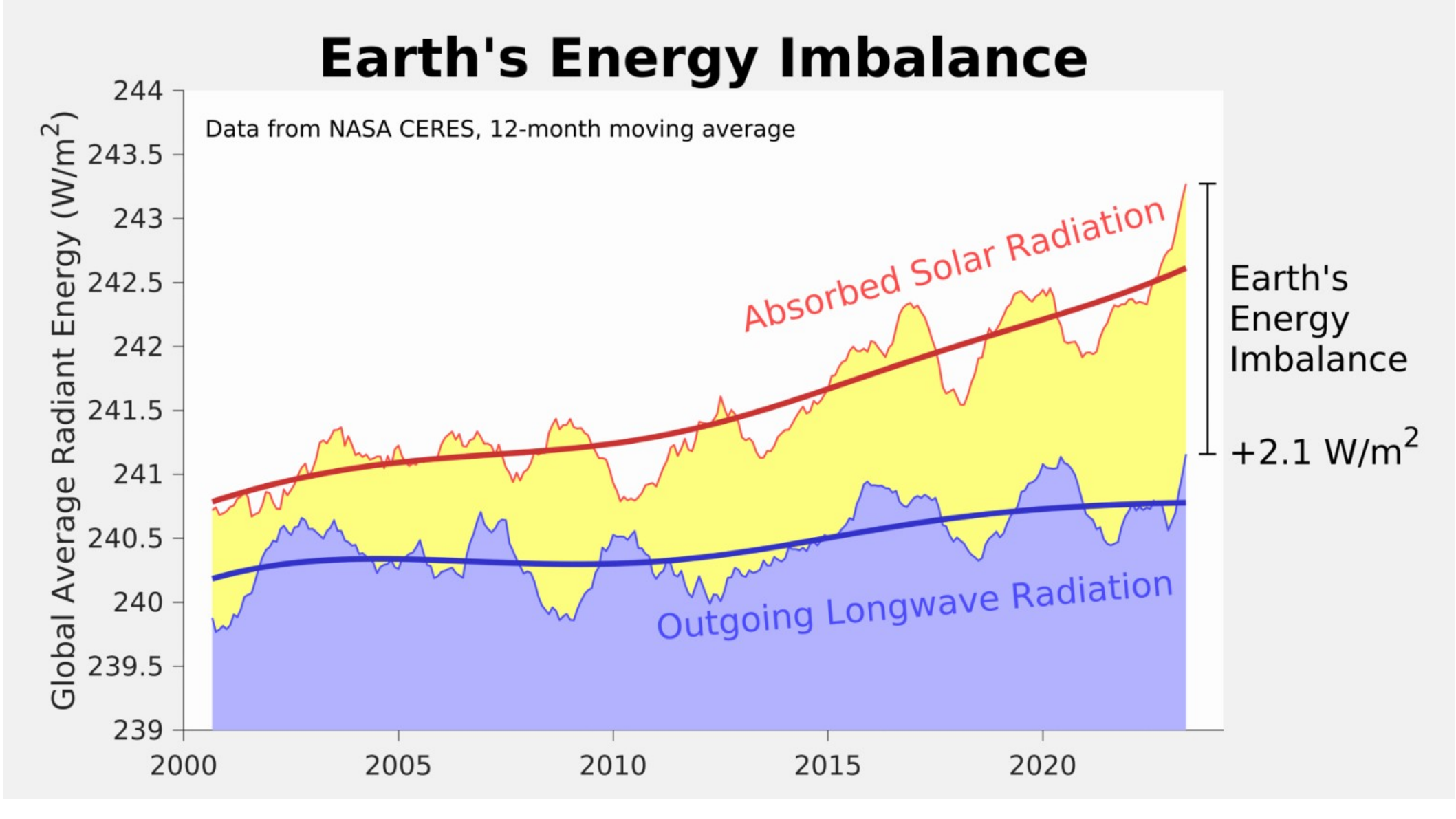


PROGRAMME OF THE EUROPEAN UNION

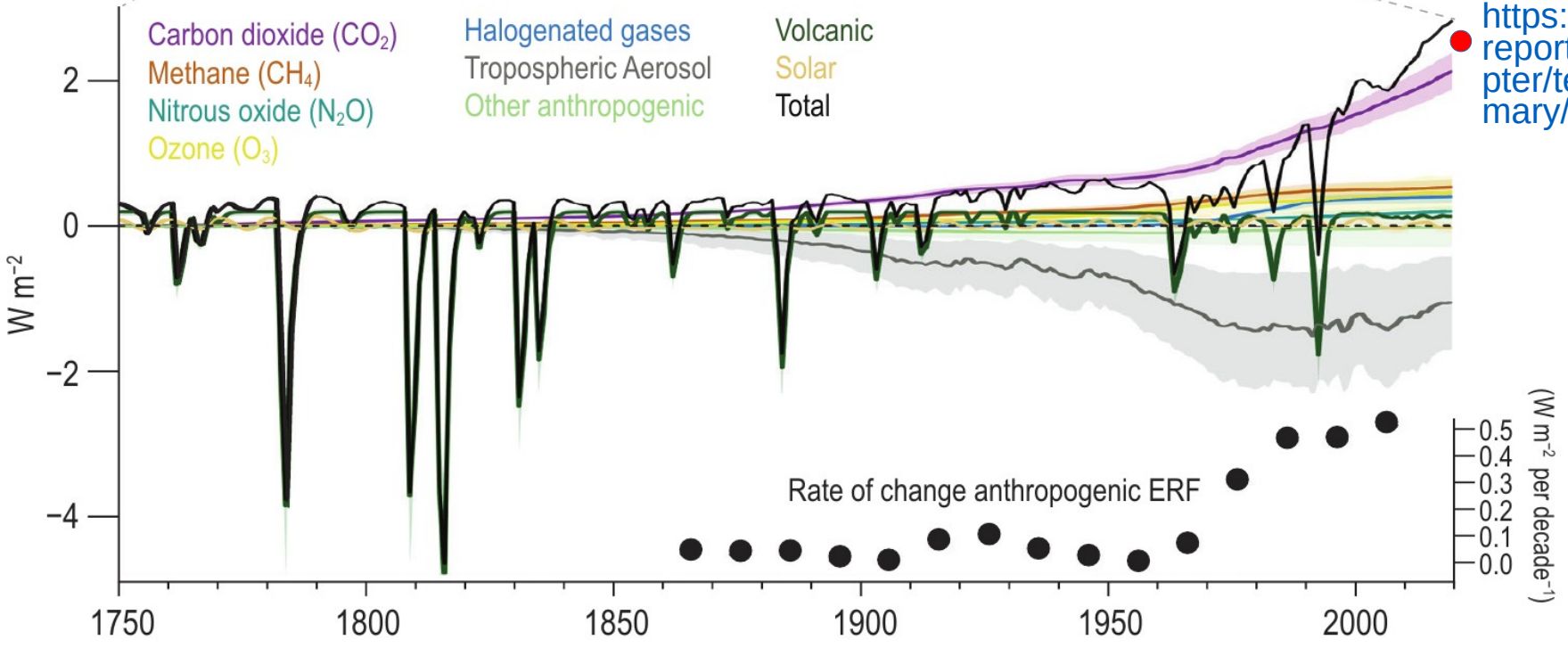
Copernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

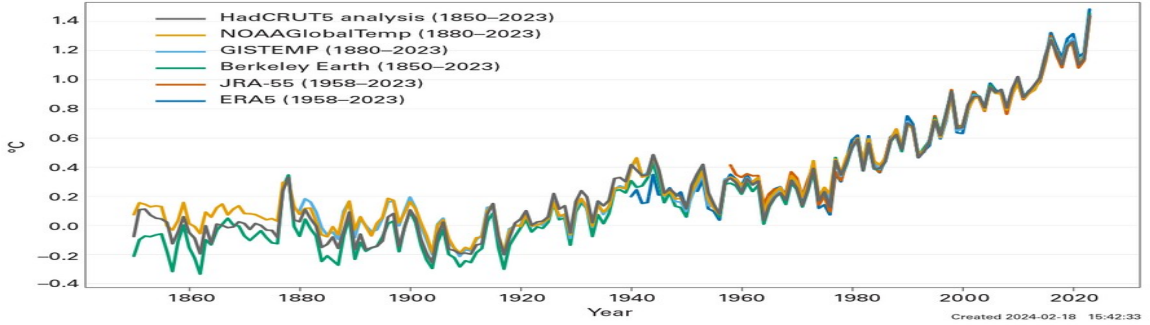
Climate Change Service


Earth's Energy Imbalance
Data from NASA CERES, 12-month moving average
Global Average Radiant Energy (W/m^2)
244
243.5
243
242.5
242
241.5
241
240.5
240
239.5
239
2000
2005
2010
2015
2020
Absorbed Solar Radiation
Outgoing Longwave Radiation
Earth's Energy Imbalance
+2.1 W/m^2

(d) The increase in effective radiative forcing (ERF) since the late 19th century is driven predominantly by warming GHGs and cooling aerosol. ERF is changing at a faster rate since the 1970s



https://www.ipcc.ch/report/ar6/wg1/chapter/technical-summary/

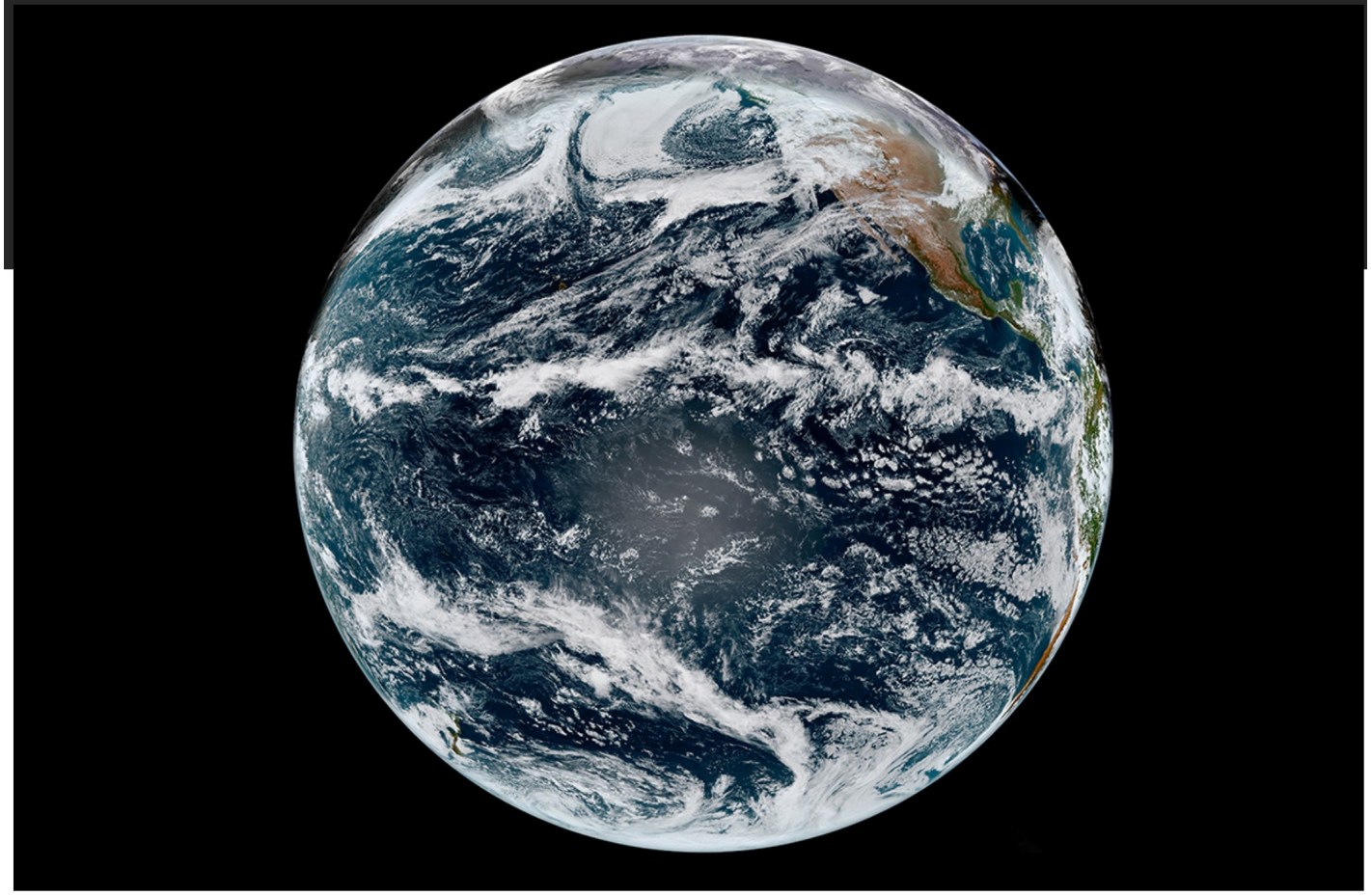


NEWS | CLIMATE

Earth's clouds are shrinking, boosting global warming

Narrowing storm bands may be a surprising and dangerous new feedback of climate change

19 DEC 2024 · 9:00 AM ET · BY PAUL VOOSEN



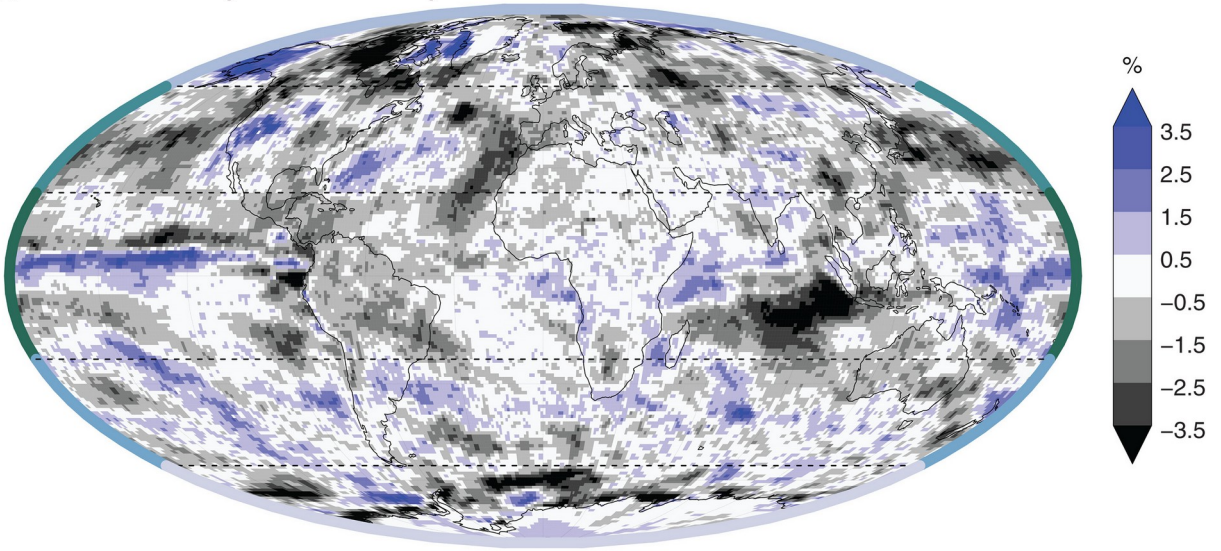
RESEARCH ARTICLE | GLOBAL WARMING

Recent global temperature surge intensified by record-low planetary albedo

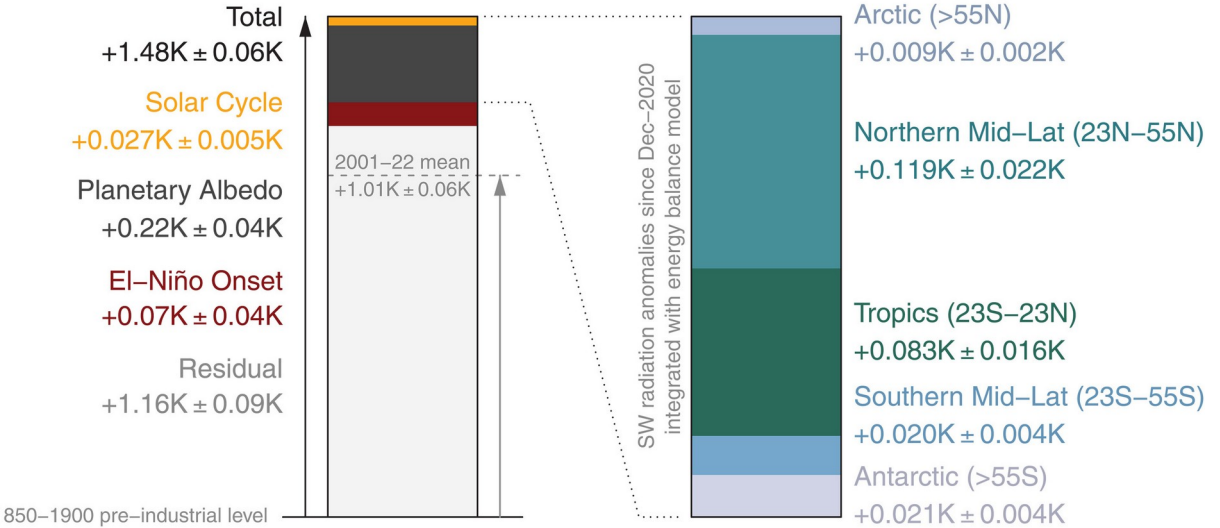
HELGE F. GOESSLING, THOMAS RACKOW, AND THOMAS JUNG Authors Info & Affiliations

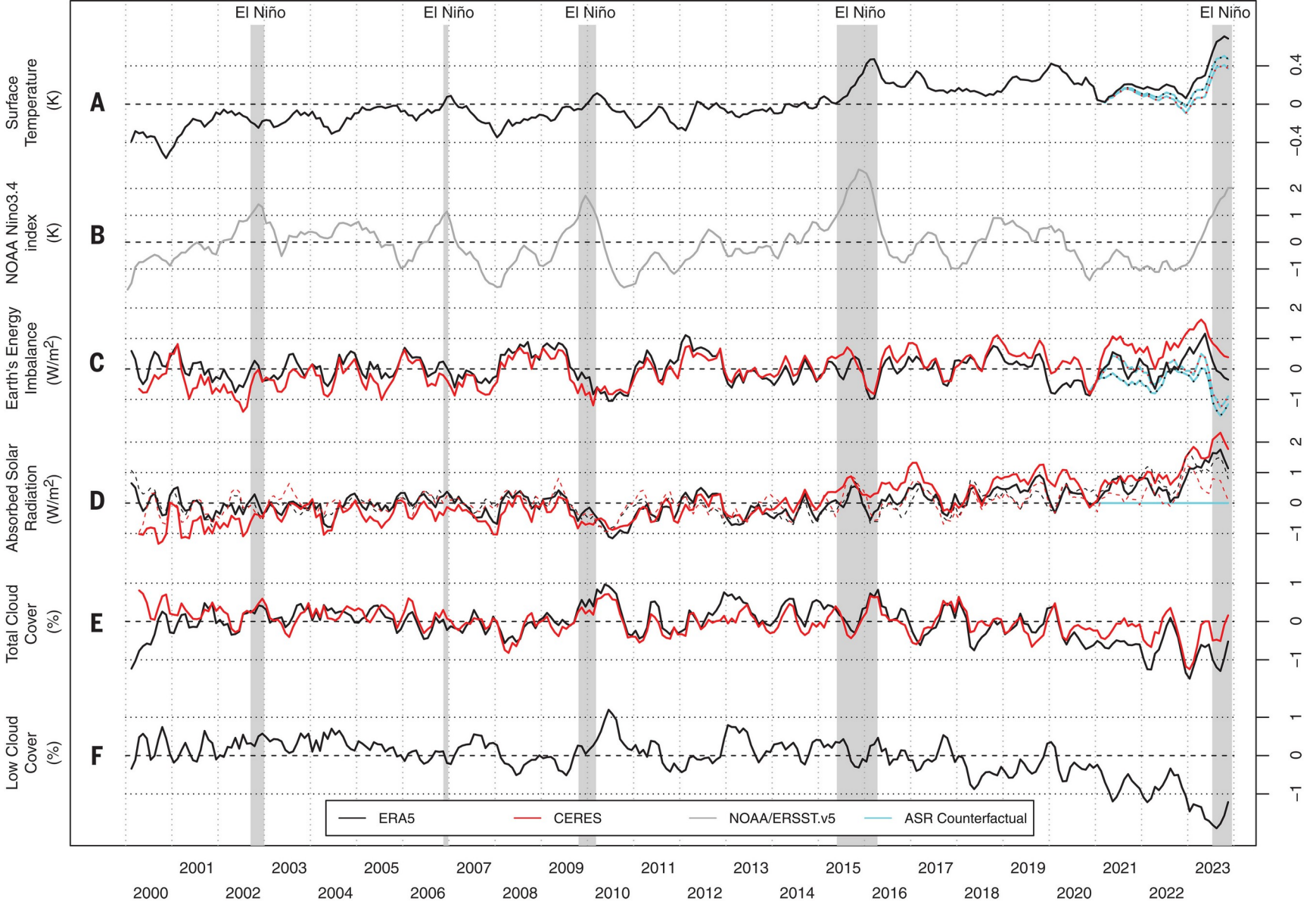
SCIENCE • 5 Dec 2024 • Vol 387, Issue 6729 • pp. 68-73 • DOI: 10.1126/science.adq7280

A CERES Planetary Albedo Anomaly 2023

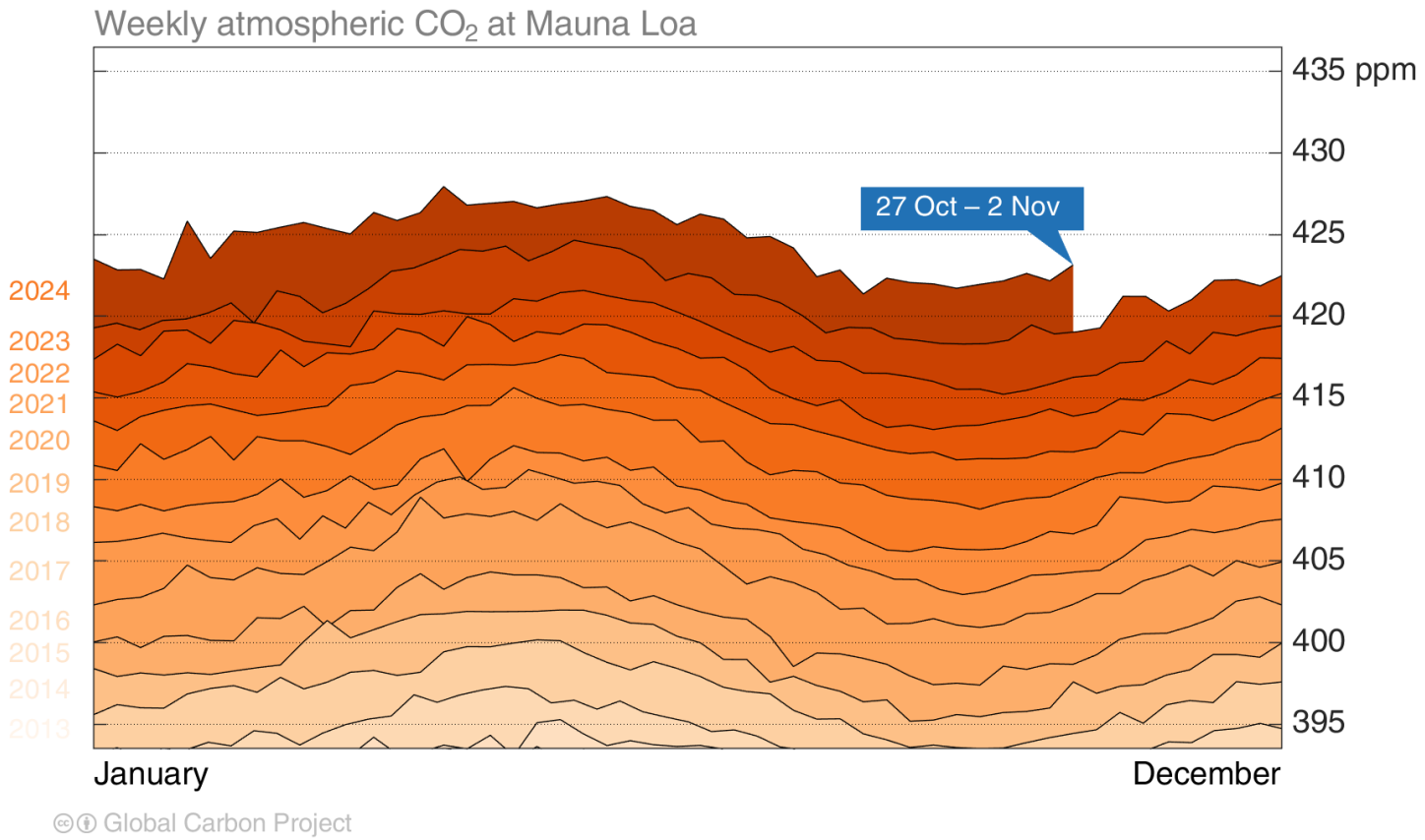


B Contributions to Global–Mean Temperature Anomaly 2023




El Niño
El Niño
El Niño
El Niño
El Niño
A
Surface Temperature (K)
B
NOAA Nino3.4 index (K)
C
Earth's Energy Imbalance (W/m²)
D
Absorbed Solar Radiation (W/m²)
E
Total Cloud Cover (%)
F
Low Cloud Cover (%)
ERA5
CERES
NOAA/ERSST.v5
ASR Counterfactual
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

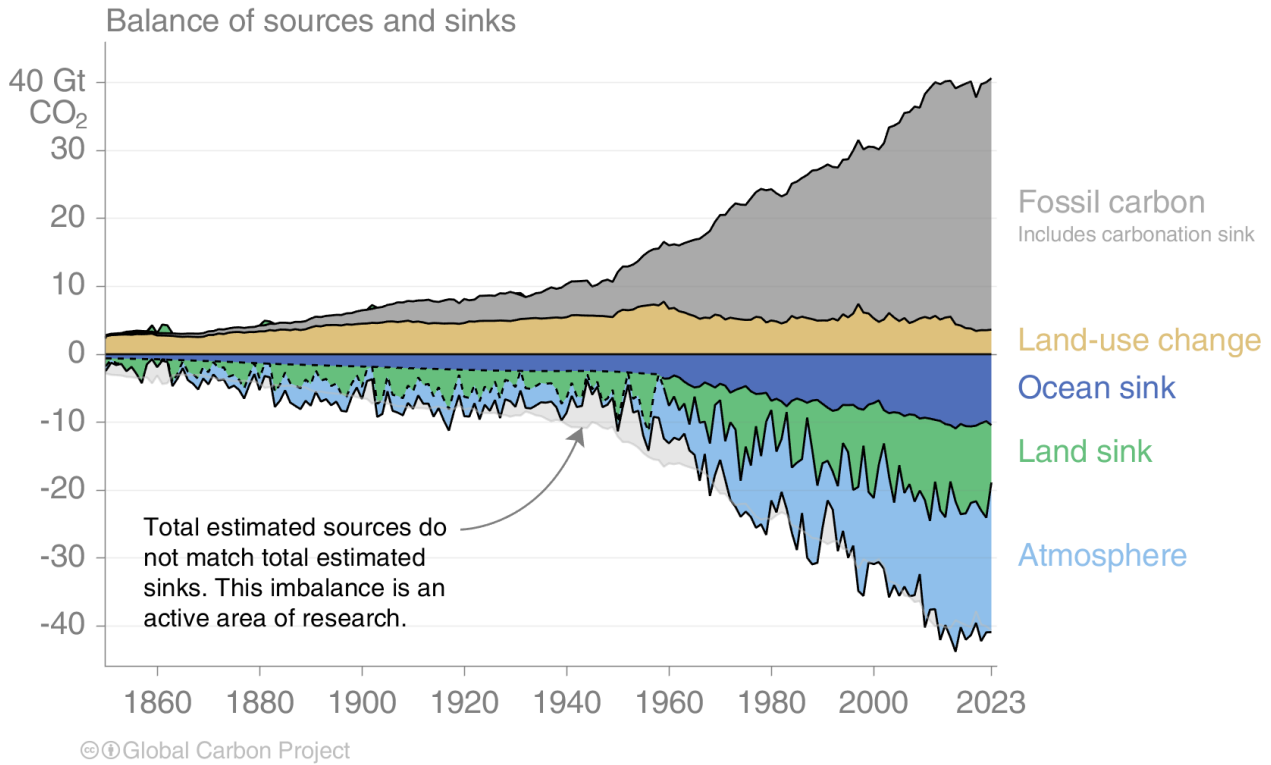
Increase of CO2 concentration



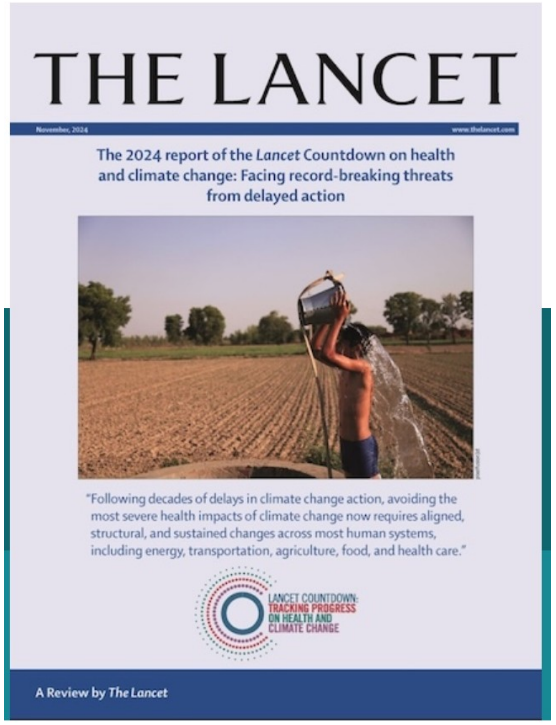
Source: Friedlingstein et al 2024; Global Carbon Project 2024

Global carbon budget

Carbon emissions are partitioned among the atmosphere and carbon sinks on land and in the ocean
The “imbalance” between total emissions and total sinks is an active area of research



Source: Friedlingstein et al 2024; Global Carbon Project 2024

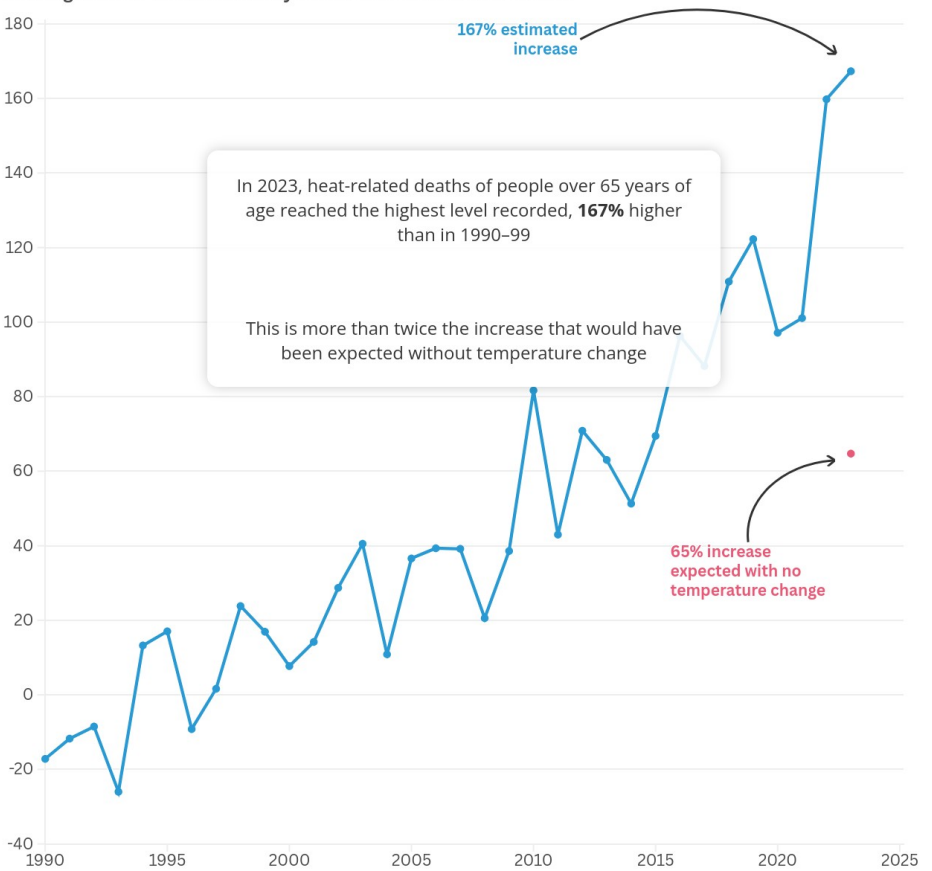


Health-Threatening High Temperatures

Annual deaths of adults over 65 years of ave attributable to health-threatening high temperatures attributable to human-induced climate change compared to counterfactual without human-induced climate change

Heat-related mortality Mortality expected if temperatures hadn't changed

% change in heat-related mortality of adults over 65 since the 1990s



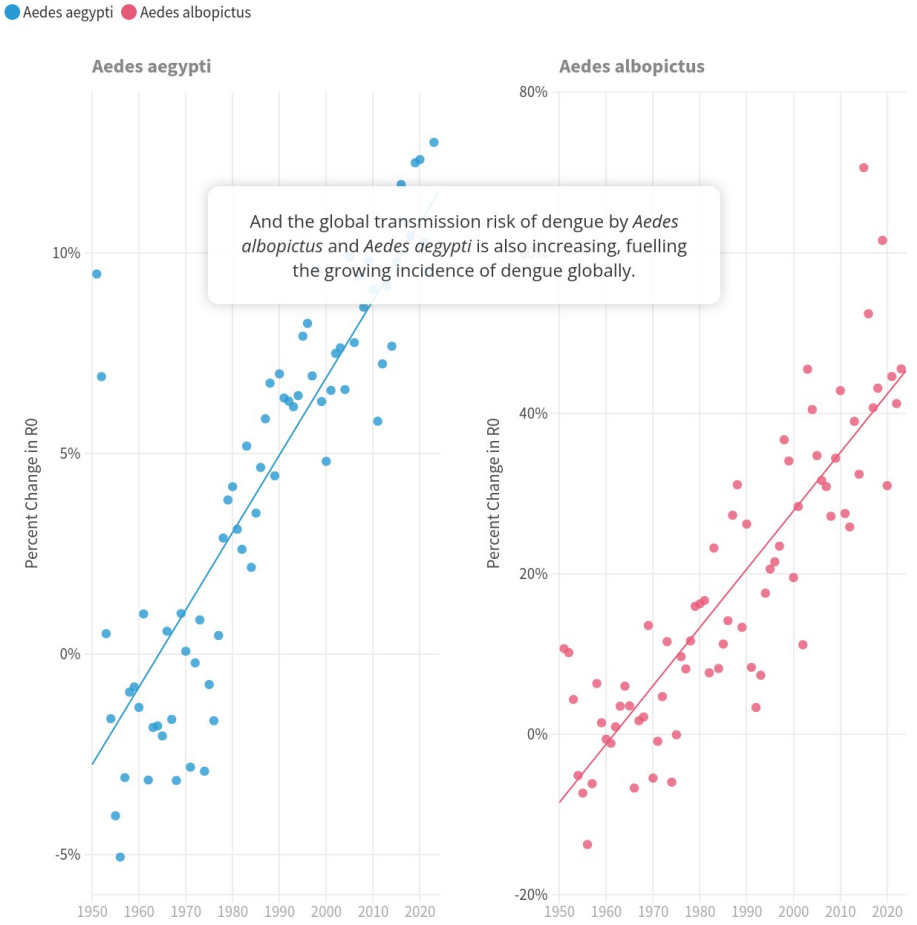
Please reference the 2024 Report of the Lancet Countdown if using this data •
For a full description of the indicator, see the 2024 report of the Lancet Countdown at lancetcountdown.org

LANCET COUNTDOWN: TRACKING PROGRESS ON HEALTH AND CLIMATE CHANGE

Climate Suitability for the Transmission of Dengue

Percent change in the basic reproduction number (R_0) of dengue by *Aedes aegypti* and *Aedes albopictus* mosquitoes, compared to 1951-1960 average

R_0 is an indication of a pathogen's contagiousness and transmissibility



Please reference the 2024 Report of the Lancet Countdown if using this data •
For a full description of the indicator, see the 2024 report of the Lancet Countdown at lancetcountdown.org

LANCET COUNTDOWN: TRACKING PROGRESS ON HEALTH AND CLIMATE CHANGE

Figure ES.3 Global GHG emissions under different scenarios and the emissions gap in 2030 and 2035

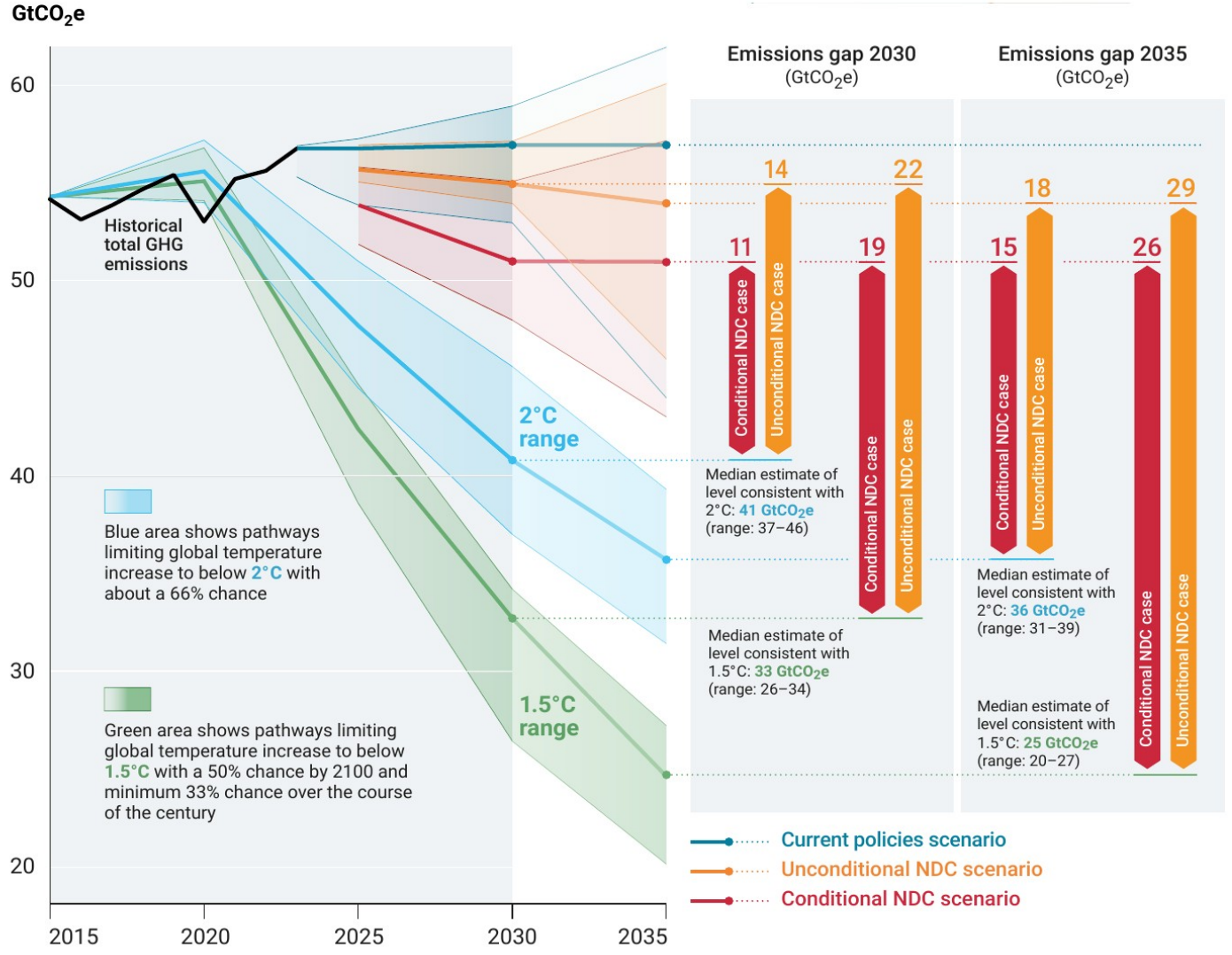
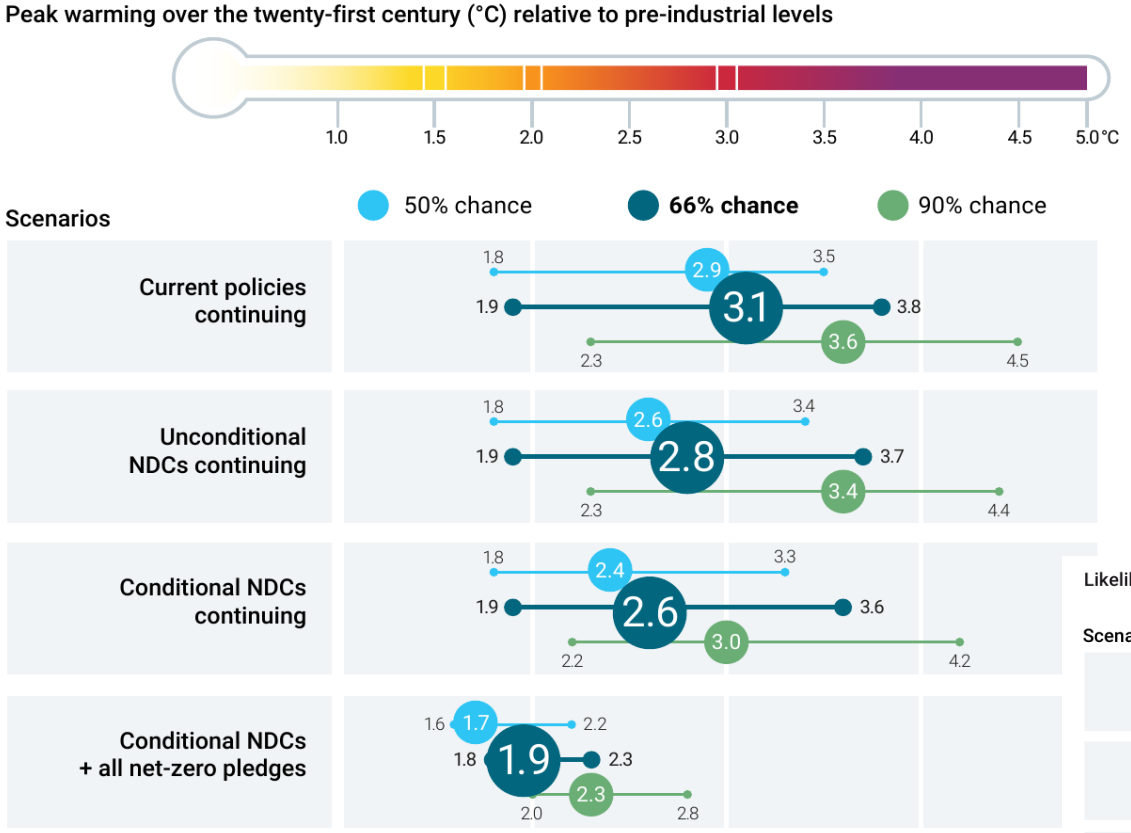


Figure ES.4 Projections of global warming under the pledge-based scenarios assessed



Likelihood of warming exceeding a specific temperature limit (%)

Scenarios	1.5°C	2°C	3°C
Current policies continuing	100% (85–100%)	97% (28–100%)	37% (1–80%)
Unconditional NDCs continuing	100% (86–100%)	94% (28–100%)	22% (1–75%)
Conditional NDCs continuing	100% (77–100%)	79% (19–100%)	10% (0–69%)
Conditional NDCs + all net-zero pledges	77% (64–97%)	20% (64–97%)	0% (0–6%)

Table ES.1 Total, per capita and historical emissions of selected countries and regions

	Total GHG emissions in 2023	Change in total GHG emissions, 2022–2023	Per capita GHG emissions in 2023	Historical CO_2 emissions, 1850–2022
	$MtCO_2e$ (% of total)	%	tCO_2e/capita	$GtCO_2$ (% of total)
China	16,000 (30)	+5.2	11	300 (12)
United States of America	5,970 (11)	-1.4	18	527 (20)
India	4,140 (8)	+6.1	2.9	83 (3)
European Union (27 countries)	3,230 (6)	-7.5	7.3	301 (12)
Russian Federation	2,660 (5)	+2	19	180 (7)
Brazil	1,300 (2)	+0.1	6.0	119 (5)
African Union (55 countries)	3,190 (6)	+0.7	2.2	174 (7)
Least developed countries (45 countries)	1,720 (3)	+1.2	1.5	114 (4)
G20 (excl. African Union)	40,900 (77)	+1.8	8.3	1,990 (77)

Note: Emissions are calculated on a territorial basis. LULUCF CO_2 emissions are excluded from current and per capita GHG emissions but are included in historical CO_2 emissions based on the bookkeeping approach. Some countries in the African Union are also least developed countries.

Nad raportem pracowali: LATA DWUDZIESTE, KANTAR

Partner merytoryczny: Global Compact Network Poland

Recenzja naukowa: Rada Klimatyczna przy UN Global Compact Network Poland

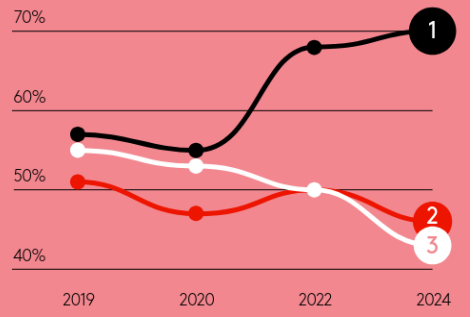
Wspierający partner merytoryczny: FORUM ODPOWIEDZIALNEGO BIZNESU

https://ziemianieatakuja.pl/

Obawy Polaków w 2024 r.

1. **70%** Wojny/konflikty zbrojne
2. **46%** Zmiany klimatyczne
3. **43%** Zanieczyszczenie środowiska

zmiany w czasie



Czy człowiek zagraża środowisku naturalnemu?

Wygodnie urządziliśmy się na tej ziemi i dzisiaj nie bardzo chcemy coś zmieniać. Liczby nie kłamią. Emisje rosną, dewastacja trwa, a my chętnie patrzymy w inną stronę. Przecież kilka lat temu zasadziłem 2 drzewka, można otrzepać ręce i pójść dalej. Pytanie: to tylko komfort czy raczej wygodna ślepota?

Michał Siegieda
Dyrektor ds. komunikacji korporacyjnej WP Holding

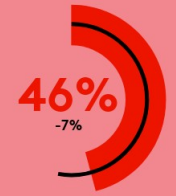
Q4. OCENA STANU ŚRODOWISKA NATURALNEGO.
A jaki jest Twoim zdaniem wpływ człowieka na środowisko naturalne?

Jaka część Polaków twierdzi, że...

Stan, w jakim znalazła się Ziemia jest poważny i wymaga natychmiastowych działań

Za technologiami ekologicznymi (np. samochody elektryczne, panele słoneczne, wiatraki) stoi interes wielkich koncernów...

Wprowadzenie przez rządy ograniczeń, które dotkną nas wszystkich, jest konieczne dla złagodzenia skutków zmiany klimatu.



Q12: Poniżej zobaczysz inne stwierdzenia, które inne osoby wypowiedziały na temat środowiska naturalnego. Na ile zgadzasz się z każdym z nich?
Top 2 boxes – Zdecydowanie się zgadzam i raczej się zgadzam

Przeczytaj artykuł Zuzanny Szybisty o rolniczych protestach i Zielonym Ładzie.

Budujemy psychiczny pancerz

W obliczu wartko płynącego strumienia złych informacji, obawy przed przyszłością stają się paraliżujące, co skutkuje rezygnacją z aktywnego działania.

Grażyna Pol,
Kierowniczka Działu Badań i Analiz, Narodowe Centrum Kultury

Mniej emocji, więcej bezradności. Szczególnie wśród najmłodszych Polaków.

Wątek dobrostanu psychicznego i depresji klimatycznej towarzyszy „Ziemianom" od początku ich pięcioletniej historii. Od 2019 roku monitorujemy także postawy pozwalające lepiej zrozumieć emocje Polaków wobec kryzysu klimatycznego.

Jaki obraz wyłania się w tym roku? Cóż, większość postaw, które mogłyby stanowić podglebie zmiany postaw i działań, wyraźnie słabnie. Budujemy pomału psychiczny pancerz, który pozwoli nam jakoś przetrwać tę katastrofę.

W obszarze postaw związanych z katastrofą klimatyczną ponownie uwagę przyciągają najmłodsi badani. Ta grupa wyraźnie rzadziej zgadza się z większością prezentowanych twierdzeń. Wyjątkiem są dwa wskazania: „niewiele mogę zrobić, za mało znaczę..." oraz „jest już za późno, aby zapobiec katastrofie klimatycznej". Wyniki tegorocznego badania „Ziemianie Atakują" wydają się być ostatecznym gwoździem do trumny popularnej przed pięciu laty idei, że młodzi wezmą sprawy w swoje ręce i uratują świat.

Stoimy na krawędzi katastrofy ekologicznej?

Q15: Obecnie coraz częściej można usłyszeć, że stoimy na krawędzi katastrofy ekologicznej. Ludzie wyrażają wobec niej różne postawy, które przedstawiamy poniżej. Spójrz na nie i zaznacz, na ile sam(a) zgadzasz się z każdą z nich. (1–5)