GLOBAL WATER MONITOR

2025 REPORT

Tracking the water cycle, water extremes, and impacts

Disclaimer

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Front cover image:

Sentinel-2 satellite image of severe flooding on Saturday, 29 November 2025, over a region east of the city of Lhokseumawe, on the northern coast of Aceh province on the island of Sumatra, Indonesia. Contains modified Copernicus Sentinel data (2025), processed by ESA

Preface

Our global water systems are under mounting pressure as climate change drives more extreme weather events and disrupts the water cycle. The year 2025 was a year of new records and not an isolated occurrence. It fits with a worsening trend of more intense floods, prolonged droughts, and record-breaking extremes. These changes impact water availability and increase the risks to lives, infrastructure and ecosystems from water-related disasters.

Reliable and timely information about water resources and hazards is more crucial than ever, yet traditional ground-based measurement networks continue to decline. Satellite observations now play a vital role, offering rapid and consistent global data on the atmosphere and Earth's surface, but they should not replace networks on the ground.

The Global Water Monitor Consortium unites public and private organisations to deliver open, actionable climate and water data. By integrating satellite and ground observations, we aim to provide timely updates on critical aspects of the water cycle. Our Global Water Monitor platform (www.globalwater.online) allows anyone to explore a wealth of climate and water data free of charge.

This third annual report builds on the work of previous years, summarising the state of the global water cycle in 2025, identifying key trends, and analysing major hydrological events. It includes updated metrics on rainfall, temperature, air humidity, river flows and water stored in lakes, soil and underground. It also provides insights into extreme rainfall and temperatures.

This report reinforces a clear message: as the planet warms, water challenges are escalating, year after year. By trying to provide information on changes and events, we hope to support informed decision-making to protect communities, infrastructure, and ecosystems in an increasingly volatile future

2 January 2026

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Chair, Global Water Monitor Consortium

Summary

Key findings

In 2025, was the third hottest year on record and experienced new hydrological extremes. Water-related disasters caused major impacts worldwide, with climate change contributing to the severity of heatwaves, floods, and cyclones.

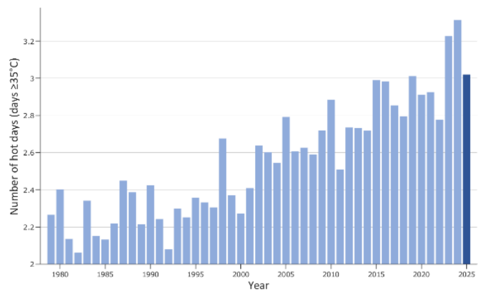
About this report

The Global Water Monitor provides free, rapid, global information on climate and water resources. This summary report contains information on rainfall, air temperature, humidity, soil and groundwater conditions, vegetation condition, river flows, flooding, and lake volumes in 2025. Trends in the water cycle and some of the most important hydrological events of 2025 are interpreted and discussed.

Global water cycle

Some key aspects of the water cycle in 2025 over the global land area were:

- *Precipitation* over land was close to average. There appears to be a declining trend. The number of record-dry months was above average and shows a significant upwards trend of 9.7% per decade.
- *Maximum daily precipitation* and the frequency of rainfall records broken both show increasing trends, of 2.3% and 4.5% per decade, respectively.
- *Air temperature* over land was the third highest on record. The frequency of record-warm months was 3.5 times the baseline average, continuing a rapid increase.
- *Maximum temperatures* were 0.71°C above the 1995–2005 baseline, and hot days were 22% more frequent. Both show significant increasing trends.
- *Minimum temperatures* are increasing, and the number of frost days was 6.3% below the baseline, continuing a significant declining trend.
- *Air humidity* over land continued its long-term decline, with record-low months twice more frequent than the baseline. Humidity was very low in Western Asia and parts of Africa.
- *Soil moisture* showed strong regional contrasts, with record-low values widespread in Europe and Siberia, while parts of Asia and South America recorded highs.

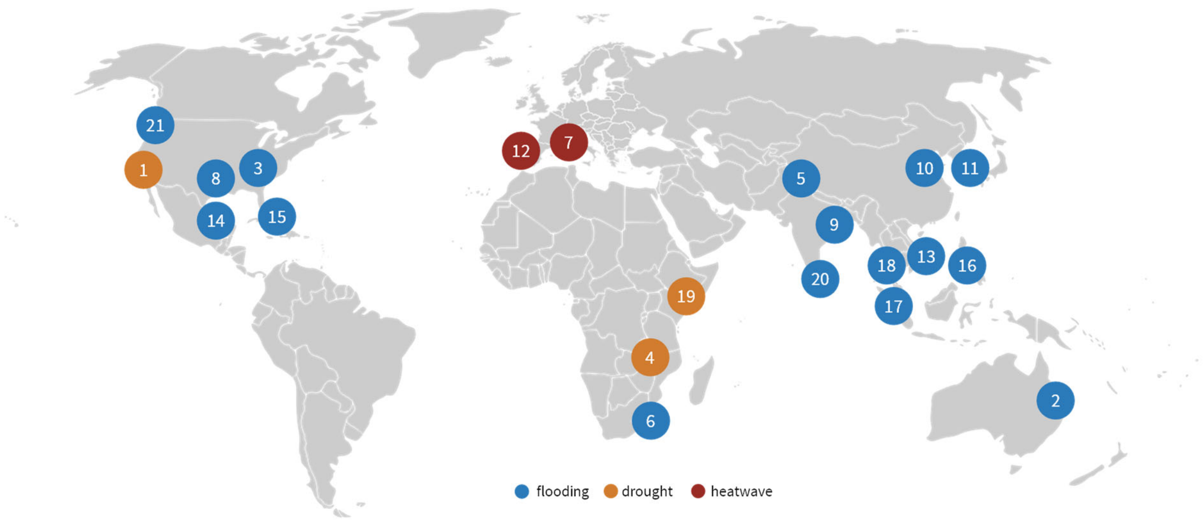


The annual number of hot days (>35°C) over the global land area has increased markedly over recent decades, indicating increased population exposure to extreme heat.

- *Vegetation greenness* was 7.6% above the 2001–2005 average, continuing a steady increase. Record-high months were 5.0 times more frequent than the baseline.
- *Surface water extent* over land was close the baseline average, but record-high monthly values were 26% more frequent, with a significant increasing trend of 3.8% per decade.
- *River flows* were 10.6% above the baseline average, with record-high flows in Africa and South America. There is a significant increasing trend of 3.8% per decade.
- *Lake and reservoir volumes* were close to the baseline, with record lows widespread in North America and Central Asia, and record highs in parts of Africa and Asia.
- *Terrestrial water storage* continued its long-term decline, with record lows in southern Europe and parts of South America, but strong increases in Western and Eastern Africa.

Major water-related disasters

Water-related disasters in 2025 caused nearly 5,000 deaths, displaced around 8 million people, and resulted in economic losses exceeding US$360 billion globally. Actual impacts were likely higher due to incomplete reporting and events not captured in global databases. Losses arose from a wide range of hazards, including tropical cyclones, floods, heatwaves, droughts and wildfires, often affecting the same regions within short time periods.



January-March
1. Los Angeles wildfires expose water supply risks
2. Queensland floods trigger record disease outbreak
3. US spring tornadoes and floods compound impacts
4. Zambia drought drives nationwide power blackouts

April-June
5. Himalayan glacial lake floods from new lakes
6. Eastern Cape rare winter floods kill hundreds

July-September
7. European heatwave causes record heat deaths
8. Texas flash floods among deadliest
9. South Asia monsoon floods displace millions
10. Northern China record rainfall causes floods
11. South Korea record monsoon floods cities
12. Iberian climate whiplash fuels extreme wildfires

October-December
13. Vietnam hit by three typhoons in weeks
14. Mexico storms amplify flooding without cyclone
15. Hurricane Melissa rapidly intensifies, huge losses
16. Philippines back-to-back typhoons
17. Rare equatorial cyclone floods Sumatra
18. Thailand–Malaysia once-in-300-years floods
19. Horn of Africa drought returns
20. Cyclone Ditwah causes Sri Lanka's deadliest floods
21. Pacific Northwest floods

Global water-related disasters in 2025. *Major disasters are shown by location, timing and disaster type. Events are grouped by calendar quarter. The map illustrates the distribution major impacts described in this report but does not aim to represent all events or their relative severity.*

Tropical cyclones were among the deadliest hazards of the year, with major loss of life in parts of South and Southeast Asia, including Indonesia and Sri Lanka. Extreme heat also caused large numbers of deaths, particularly in Europe, where summer heatwaves were linked to tens of thousands of heat-related fatalities. Flooding led to widespread displacement across South and Southeast Asia, while drought continued to affect food security and livelihoods in parts of Africa. Economic losses globally were among the highest recorded. Single events caused damage equivalent to a large share of national GDP in some countries. In several regions, impacts were amplified by stress on critical infrastructure, including water supply, energy systems and flood protection, much of which was designed for past climate conditions.

Climate Change and Emerging Hazards

Climate change influenced several disasters in 2025 (see 'Regions in Focus' for details). Cyclone Ditwah in Sri Lanka produced rainfall 28–160 per cent heavier than would have occurred in a pre-industrial climate; formed unusually close to the equator and remained strong longer than expected. Cyclone Senyar became only the second recorded tropical cyclone in the Strait of Malacca, indicating cyclone occurrence in a historically rare location. Hurricane Melissa in the Caribbean caused wind speeds around 7 per cent stronger and rainfall about 16 per cent heavier due to warmer ocean conditions. European heatwaves were 2–4 °C hotter and up to 70 times more likely in parts of the UK, contributing to large numbers of heat-related deaths. Heatwave-induced wildfires in Spain and Portugal occurred under fire-weather conditions that were around 40 times more likely and 30 per cent more intense than in a pre-industrial climate. Glacial lake outburst floods in the Hindu Kush Himalaya were unprecedented, with six events within four months. Several of the most damaging floods originated from newly formed lakes not included in existing monitoring systems.

Preparedness and Adaptation

Disaster outcomes in 2025 varied depending on preparedness, land use and infrastructure design. Severe losses occurred where systems were based on historical conditions, including cyclone-related flooding in Sri Lanka and Indonesia during Cyclones Ditwah and Senyar, water system failures during the January wildfires in Los Angeles, USA, and prolonged electricity shortages in Zambia linked to depleted hydropower storage at Lake Kariba. By contrast, early-warning systems and evacuation planning reduced loss of life during several major floods, including atmospheric river events in the Pacific USA and Canada, while monitored glacial lakes and warning systems prevented fatalities in some glacial lake outburst floods in the Hindu Kush Himalaya. Overall, 2025 showed that preparedness consistently reduced deaths, but could not prevent severe disruption and economic losses where exposure and infrastructure vulnerabilities remained high.

Outlook for 2026

Hydrological conditions at the end of 2025 show below-average soil moisture, vegetation health, and water storage across Mediterranean countries, the Horn of Africa, Brazil, and parts of Central Asia, indicating potential drought risk for these regions in 2026. Conversely, the Sahel, South Africa, Northern Australia, and most of Asia face greater risks of flooding and landslides due to excessive wetness. Ongoing climate change is expected to drive higher global temperatures in 2026, increasing the likelihood of heatwaves, bushfires, intense storms, and rapid-onset flash floods and droughts worldwide.

Contents

Measuring and Interpreting Change

How do satellites measure water?

Since the first Earth-observing satellite was launched sixty years ago, satellite remote sensing has become a crucial part of weather observation and forecasting systems worldwide. In more recent decades, the use of satellites to observe water at and below the Earth's surface has developed into practical solutions. Ideally, satellite measurements are calibrated to on-ground measurements where they exist to increase their accuracy. Once calibrated, they can provide information much faster, over much larger areas and with much greater detail than the on-ground measurement network alone.

All data discussed in this report were developed using methods that have been published:

Precipitation, temperature and **relative air humidity** are derived by reanalysis, combining satellite observations with all globally available weather station data and information from weather forecasting models[1]

Soil water is interpreted from measurements by passive and active (radar) satellite microwave instruments and made available by the EU Copernicus Climate Data Store[2]

Surface water occurrence, including lakes, rivers and other forms of (temporary) inundation, was mapped using NASA's MODIS satellite imagery[3].

River flows are estimated by automated measurement of river width in satellite imagery[4]

Lake and reservoir volume is estimated by combining satellite measurements of surface water level and extent with topography[5].

Vegetation condition (NDVI) responds to water availability and is observed by NASA's MODIS satellites[3].

Terrestrial water storage, including groundwater, soil water, surface water, snow and land ice, is derived from gravity measurements by the GRACE Follow-On satellites[6]. Missing data were imputed using a deep-learning approach[7]

The Global Water Monitor data explorer

The key objective of the Global Water Monitor is to make up-to-date, global and accurate climate and water information freely available and easily accessible. We developed a visual data explorer, the Global Water Monitor (www.globalwater.online). All data shown in this report are directly derived from that website and, therefore, can be reproduced or examined in more detail. Users can retrieve and visualise maps or time series for any location, administrative hydrological region or hand-drawn area. Some background on the calculations and interpretations available and as used in this report is provided below.

1 Beck et al., Bulletin American Meteorological Society, 2022 (link)
2 Copernicus Climate Data Store (link, v202505 combined product)
3 NASA and USGS Earth Data (link)
4 Hou et al., Remote Sensing of Environment, 2022 (link)
5 Hou et al., Hydrology and Earth System Sciences, 2022 (link)
6 Boergens et al. (2019) (link), also available from GraVIS (link)
7 Mo et al., Geophysical Research Letters (2025) (link)

Global averages, trends, and record frequencies

Annual global averages are calculated as area-weighted means across all countries. These global annual values are interpreted relative to the baseline period 1995–2005 (or the nearest overlapping period available for a given dataset). Conditions for the most recent year are reported as both an absolute and percentage difference from the baseline mean. Long-term trends in global annual averages are assessed using ordinary least-squares linear regression against year and are reported only where statistically significant ($p < 0.05$), expressed in units and percent change per decade relative to the baseline mean.

Record frequencies are evaluated independently of global averages at the catchment scale. For each of the 4,687 catchments, a monthly record is identified when the value for a given calendar month exceeds or falls below all previous observations for that same month in the time series. Annual record-frequency metrics summarise the frequency with which catchments experienced monthly records in a given year, relative to the baseline period. Trends in record frequencies are assessed using linear regression of the annual record-frequency time series.

Understanding Anomalies

The ‘normal’ range of climate and water conditions varies worldwide, from arid deserts to tropical monsoon regions and frozen poles. Percentages and anomalies are insightful ways of comparing actual values to the distribution of values for the same area and time of year in the historical record. The metrics available in the Global Water Monitor and used in this report are:

Anomaly or absolute difference from mean provides information on the departure from long-term average conditions. For example, rainfall in a particular period (e.g., March to September) may be 100 mm more than the average for the same period in all previous years.

Percentage of the mean puts the same information in a relative context. For example, the same 100 mm difference would be 110% of (or 10% above) a longer-term average value of 1000 mm.

Standardised anomaly or σ (sigma) value is a useful means to compare the actual conditions to previous years in a way that accounts for the year-to-year variation experienced historically. It is calculated by dividing the actual anomaly by the standard deviation of values in previous years. Below is a general interpretation of the colour scale used in most maps in this report. Extremely high or low values often coincide with record values in the time series, but that is not automatically the case.

Sigma (σ)	Description*
> 4.0	*extremely high*
3.0 – 4.0	*extremely high*
2.0 – 3.0	*unusually high*
1.0 – 2.0	*high*
0.50 – 1.00	*above average*
-0.50 – 0.50	*near average*
-1.0 – -0. 50	*below average*
-2.0 – -1.0	*low*
-3.0 – -2.0	*unusually low*
-4.0 – -3.0	*extremely low*
< -4.0	*extremely low*

Colour legend and interpretation of standard anomalies. Note that colours are reversed for air temperature to be more intuitive. For reference, this figure is also provided in the back of the report (p. 63).

Summarising by country or catchment

Summaries were calculated by **country** as defined by the International Organisation for Standardization (ISO 3166-1) and include the 193 UN member countries as well as other administrative entities. In the Global Water Monitor, summary data are also available for subnational regions (e.g., states and provinces). No political statement is intended by use of the ISO and UN lists.

Many **river basins** cover more than one country and conversely, large countries may contain multiple river basins. Therefore, summaries were also calculated by river basin. In the case of islands and coastal regions with multiple small catchments, river 'basins' can be a series of bordering catchments. In the Global Water Monitor, summary data are also available for individual smaller catchments within basins.

Limitations

If there are no gaps in the data, averages across countries or catchments can be calculated directly. If there are some missing data, they can be estimated. However, if most data are missing, calculated averages can be misleading.

Summarising storage in lakes by country or basin is straightforward in principle, as they can be added up. However, not all water bodies are measured all the time, and gaps in the data need to be estimated.

Summarising river flows by country or catchment is challenging. For example, many countries contain multiple rivers. We selected the fifteen river observation locations with the largest long-term average flows within the country or catchment and calculated a weighted average value. By its very nature, averaging over years and regions can hide locally severe conditions or extreme events that occur over short periods. This should be kept in mind when interpreting the information.

Satellite instruments can provide a near-immediate global overview of climate and water conditions, but they have uncertainties. Where available, onsite observations are usually more accurate and necessary to calibrate remote sensing approaches like those used here. Protecting and expanding the remaining water measurement station network should be a priority.

Record length, frequency and spatial detail vary between data sources. For example, climate data are available from 1979, water body data from 1984, soil water data from 1991, river flow data from 2000, and terrestrial water storage data from 2002 onwards.

Even satellite observations are unavailable in some regions and at some times. For example, soil water observations are only possible if the soil is not frozen or covered with dense forest, and surface water and vegetation observations require daylight and clear skies. In the case of climate data, data gaps are filled by weather models with uncertainties of their own.

Efforts were made to confirm the interpretation of the data using background research, but the above limitations should be kept in mind when reading this report. Anyone inclined to take action based on the information presented here should first consult the relevant local or national agencies.

Global Summary

- Precipitation
- Maximum daily precipitation
- Air temperature
- High temperatures
- Low temperatures
- Air humidity
- Soil water
- Vegetation condition
- Surface water occurrence
- River flows
- Lake volume
- Terrestrial water storage

Precipitation

Key findings

Global precipitation over land was close to average. There appears to be a declining trend. The number of record-dry months was above average and shows a significant upwards trend of 9.7% per decade.

Global averages

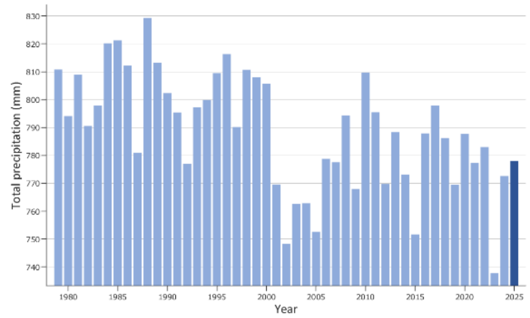
The global land-area average annual precipitation in 2025 was 778 mm, around 7 mm (0.9%) lower than the 1995–2005 baseline average of 785 mm. Precipitation in 2025 was higher than in 2024 but within the historical range. There is a statistically significant decreasing trend of −1.1% per decade.

Record highs

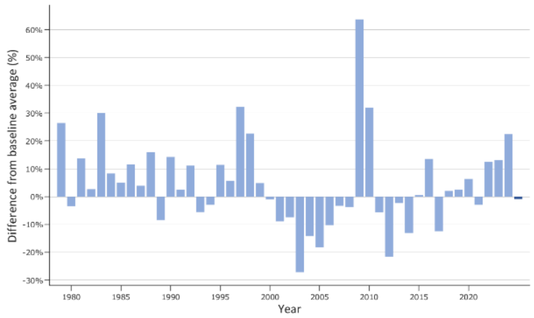
Record-high monthly precipitation values were around 0.9% less frequent than during the 1995–2005 baseline period. There is no statistically significant long-term trend in record-high months.

Record lows

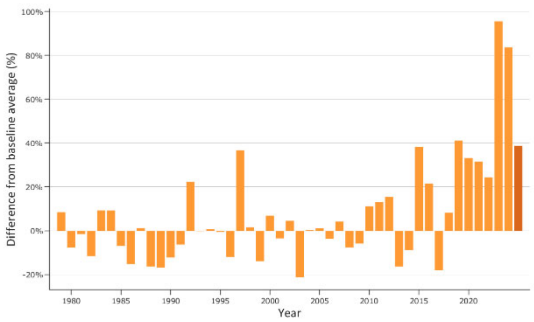
The frequency of record-low monthly precipitation values across the 4,687 catchments worldwide was around 39% higher than the 1995–2005 average. There is a statistically significant long-term trend in record-low months, with changes of approximately 9.7% per decade.



Average annual precipitation over land.



The number of times high monthly precipitation records were broken relative to the baseline period 1995-2005



The number of times low monthly precipitation records were broken relative to the baseline period 1995-2005

By country

Ten countries recorded their lowest annual precipitation totals on record in 2025. These were the United Arab Emirates, Armenia and Syria in Western Asia; Iran in Southern Asia; Kyrgyzstan, Tajikistan and Uzbekistan in Central Asia; the Central African Republic in Middle Africa; and Ghana and Togo in Western Africa. A further two countries experienced unusually low precipitation without setting records: Turkmenistan in Central Asia and Türkiye in Western Asia.

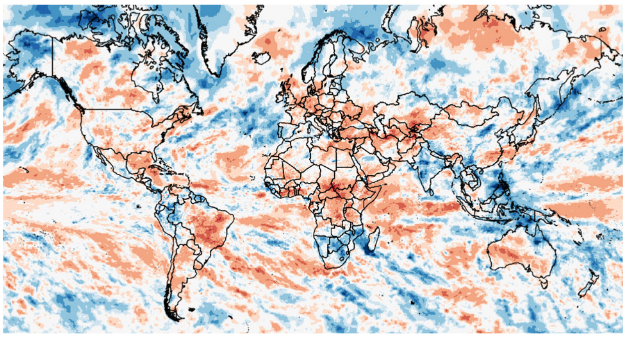
Three Asian countries recorded record-high annual precipitation: India, the Philippines and Viet Nam. Sierra Leone in Western Africa experienced unusually high precipitation without setting a record.

By river basin

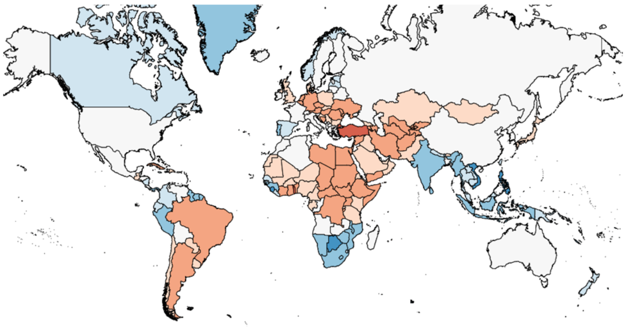
Eight river basins recorded record-low annual precipitation in 2025. These included Socotra in Africa; six basins in Asia, including the Western Caspian Sea, Persian Gulf Coast, Persian Interior, Tarim, Aral–Amu Darya and Issyk-Kul basins; and the Parnaíba basin in South America. An additional four basins experienced unusually low precipitation without setting records, including basins along the eastern Mediterranean, the southern Black Sea coast, the Eastern Caspian Sea, and the Tigris–Euphrates system.

Eleven river basins recorded record-high annual precipitation. These included the Vietnam Coast and India Bengal Coast basins in Asia; several basins across Oceania, including the Philippines and Maluku regions; and three Arctic basins, including the Yukon, Banks Island and Victoria Island basins. A further four basins experienced unusually high precipitation without setting records, distributed across Africa, Siberia, Oceania and the Arctic.

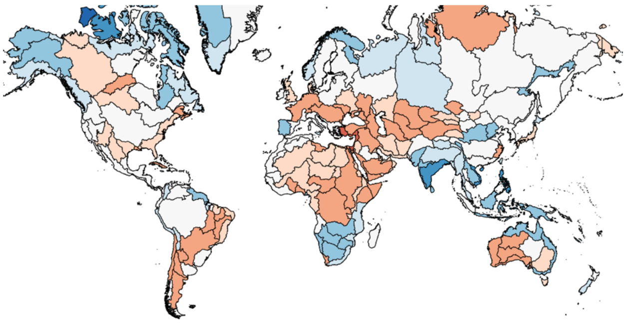
Standardised anomaly in annual precipitation (see p. 9 or p. 63 for legend)



By country



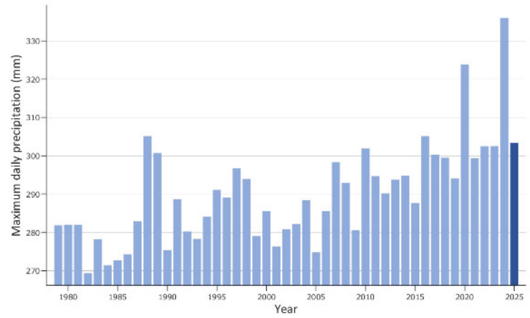
By river basin



Maximum daily precipitation

Key findings

The annual maximum daily precipitation records and the frequency of rainfall records broken both show increasing trends, of 2.3% and 4.5% per decade, respectively.



Annual maximum 24h precipitation over land.

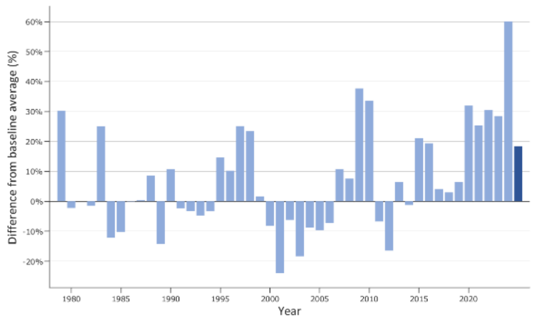
Global averages

The highest daily maximum rainfall in 2025 – averaged over 4,687 catchments worldwide – was 6.3% higher than for the 1995–2005 baseline period. There is a statistically significant long-term increase of 2.3% per decade.

Record highs

The frequency of record-high monthly values for daily maximum rainfall was 18% above the 1995–2005 average. There is a statistically significant increasing trend of 4.5% per decade.

Research has found that increasing trends in extreme precipitation over shorter periods (five days or less) have become more common than decreasing trends[8]. This would be expected to increase the risk of local flash floods.



The number of months 24h precipitation records were broken relative to the average for the baseline period (1995-2005)

[8] Seneviratne et al. (2021) *Weather and Climate Extreme Events in a Changing Climate. In: Climate Change 2021: The Physical Science Basis*, pp. 1513-1766 (link)

By country

Four countries recorded their highest annual daily maximum rainfall in 2025: Botswana in Southern Africa, Eritrea in Eastern Africa, Bulgaria in Eastern Europe, and the Philippines in Southeast Asia.

Two countries experienced extremely high annual daily maximum rainfall without setting records: Jamaica in the Caribbean and Mozambique in Eastern Africa.

A further ten countries recorded unusually high values without setting records. These were Azerbaijan in Western Asia; Indonesia, Singapore, Thailand, and Viet Nam in South-eastern Asia; Sri Lanka in Southern Asia; Congo in Middle Africa; Tanzania in Eastern Africa; Denmark in Northern Europe; and the Marshall Islands in Micronesia.

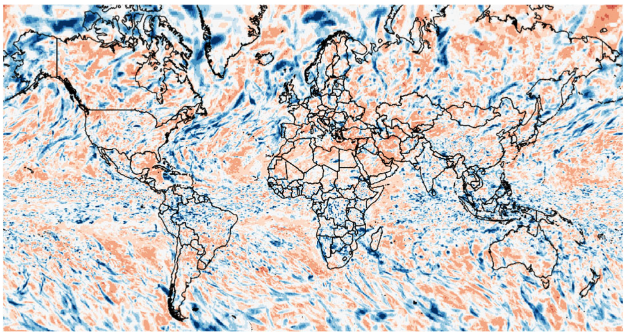
By river basin

Fourteen river basins recorded record-high annual daily maximum rainfall averaged across their area in 2025. These included the Coasts of the Red Sea, East Africa and Namibia in Africa; the Western Baltic Coast in Europe; the Malaysian Peninsula, Tanjung Piai–Singapore Strait, Kalimantan, and Philippines in Southeast Asia; the Magdalena, Amazonas, and Marajó basins in South America; and the Arctic Alaskan Coast and Banks Island. Jamaica experienced extremely high values without setting a record.

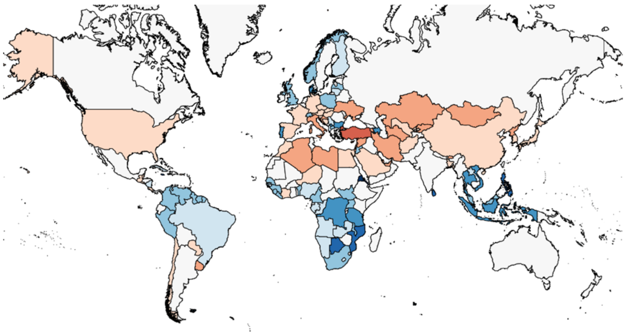
A further seven basins recorded unusually high annual daily maximum rainfall without setting records. These were Sri Lanka, Java, West and North Papua in Asia; the Falkland Islands in South America; and two Arctic basins.

High maximum rainfall events over small river basins and islands are more likely to have had major impacts than high events when averaged over larger basins and countries.

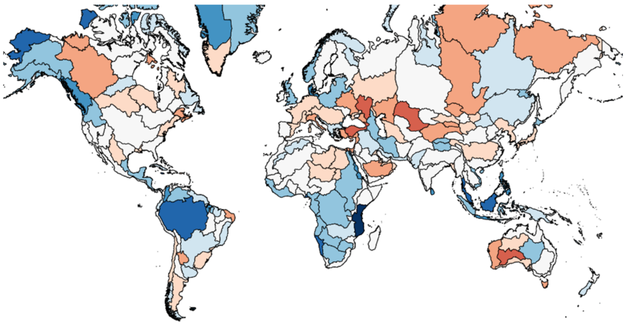
Standardised anomaly in annual maximum 24h precipitation (see p. 9 or p. 63 for legend)



By country



By river basin



Air temperature

Key findings

Average temperature over land was the third highest on record. The frequency of record-warm months was 3.5 times the baseline average, continuing a rapid increase.

Global averages

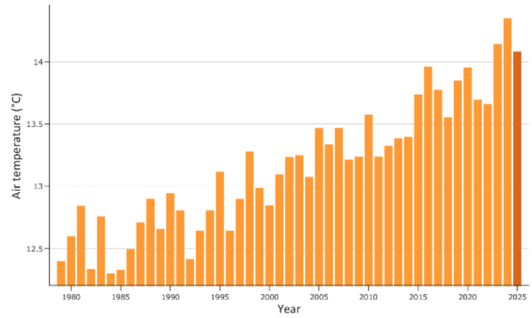
Air temperature across land was 1.0°C above the 1995–2005 average, slightly lower than the record high value of 1.2°C the previous year but still the third highest year on record. There is a statistically significant increase of 0.36°C per decade.

Record highs

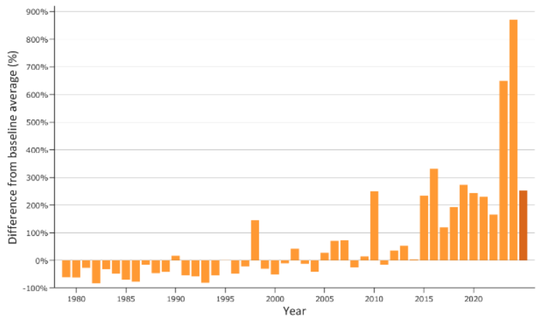
The number of record-high monthly average temperatures in the 4,687 river catchments worldwide was 3.5 times the 1995–2005 average. There has been a rapid increase in record-breaking high monthly temperatures of 97% per decade.

Record lows

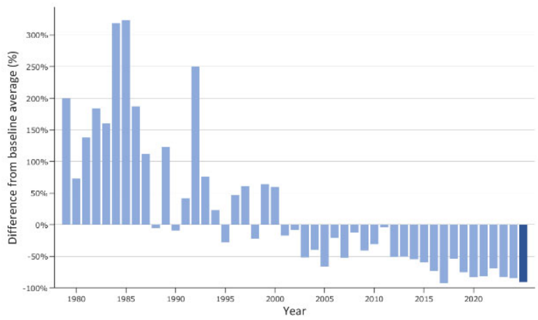
The number of record-low monthly average temperatures was 91% less frequent than the baseline average. There is a significant decreasing trend of -65% fewer record-breaking low monthly average temperatures per decade.



Annual average temperature over the global land area.



The number of times high monthly average temperature records were broken compared to the average for 1995-2005.



The number of times low monthly temperature records were broken compared to the average for 1995-2005.

By country

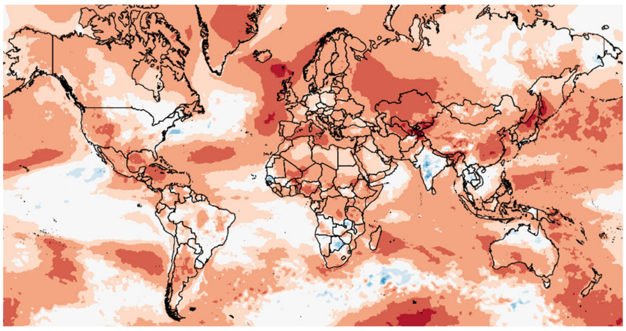
No countries recorded unusually low annual air temperatures in 2025. Five countries recorded record-high temperatures: in Central Asia, Kazakhstan, Kyrgyzstan and Tajikistan, and in Southern Asia, Pakistan and Bhutan. A further eight countries recorded unusually high but not record temperatures, including Nepal and Uzbekistan in Asia, Albania and Malta in Southern Europe, the Dominican Republic and Jamaica in the Caribbean, and Vanuatu in Oceania.

By river basin

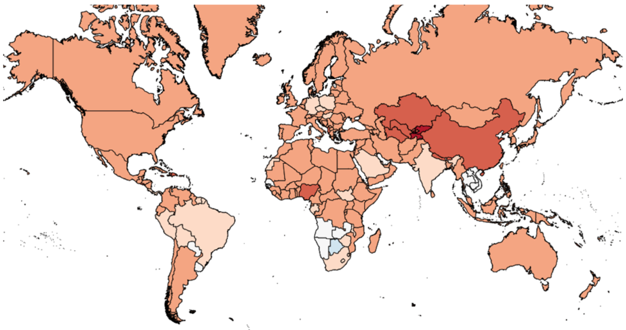
No river basins experienced unusually low annual air temperatures in 2025, whereas record-high temperatures were observed in 16 basins. In Asia, seven basins recorded record highs, including the Volga, Ural and several basins along China's coast. Three basins in Europe and three in Oceania also recorded record highs, as did two Arctic basins and one in South America.

A further 18 basins recorded unusually high but not record temperatures, including the Yangtze and Ob basins in Asia, seven basins in Oceania, and three Arctic basins.

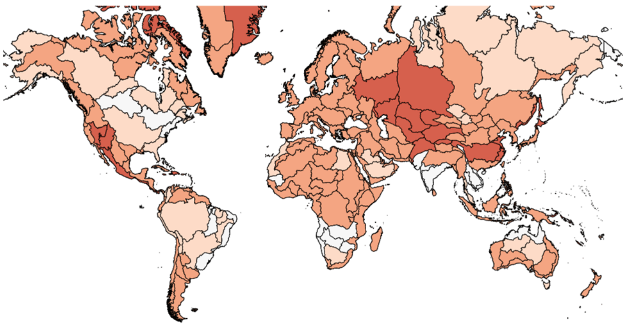
Standardised anomaly in annual average air temperature (see p. 9 or p. 63 for legend - note the colour scale is reversed for temperature, with red showing higher temperatures)



By country



By river basin



High temperatures

Key findings

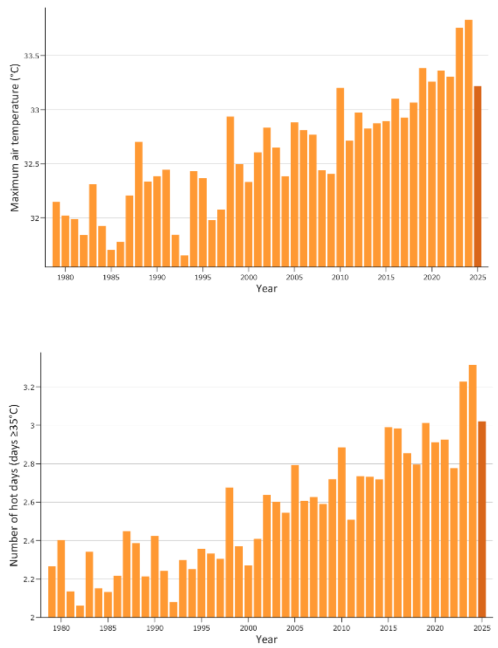
Annual maximum temperature was 0.71°C above the 1995–2005 baseline, and hot days were 22% more frequent. Both show significant increasing trends.

Global averages

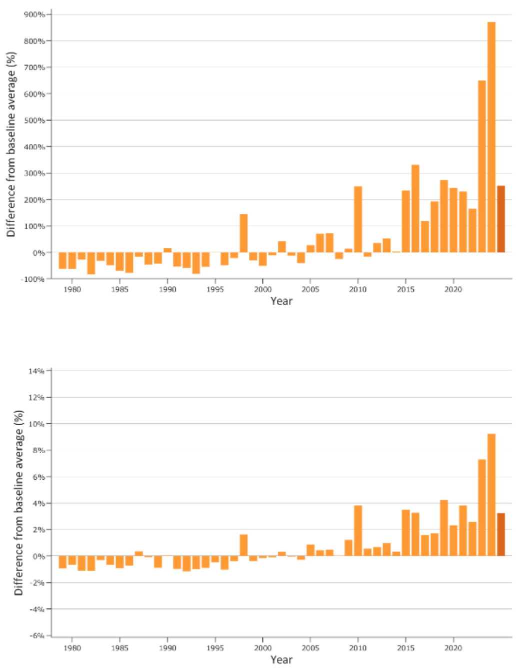
In 2025, the annual maximum temperature – averaged over all catchments worldwide – was 0.71°C higher than for the 1995–2005 baseline period. There has been a statistically significant upward trend of 0.34°C per decade. The global average number of hot days (days reaching 35°C) was 22% higher than the baseline period and shows a statistically significant upward trend of 8.3% per decade.

Record highs

Record-high monthly maximum temperatures across all catchments worldwide were 2.9 times more frequent in 2025 than during the baseline period and showed a significant increasing trend of 63% per decade. For hot days, record-high monthly numbers were 3.0% more frequent in 2025, with a significant increasing trend of 1.2% per decade.



Annual maximum temperature (top) and number of hot days (bottom) over the global land area.



Annual number of times monthly record high maximum temperature (top) and number of hot days (bottom) occurred in the time series relative to the baseline period (1995-2005).

By country

No countries experienced unusually low maximum temperatures or hot days in 2025. Record-high annual maximum temperatures were observed in seven countries, and record-high hot days in ten countries. Four countries experienced record-high maximum temperatures and number of hot days: Türkiye in Western Asia, Tajikistan in Central Asia, and, in Southern Europe, Portugal (hot days only as record) and Andorra and Montenegro (maximum temperature only).

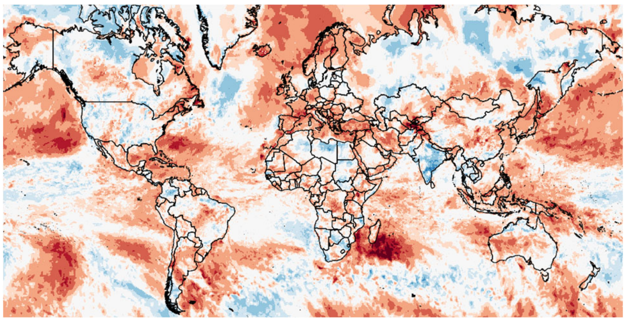
Countries with record-high hot days included Iran and Afghanistan in Southern Asia, Kyrgyzstan in Central Asia, Armenia in Western Asia, and Nigeria, Cameroon and Djibouti in Africa. Unusually high values for either variable were recorded in a further 16 countries, including Spain, France and Germany in Europe, Japan and China in Eastern Asia, Argentina in South America, and several countries in Western Africa.

By river basin

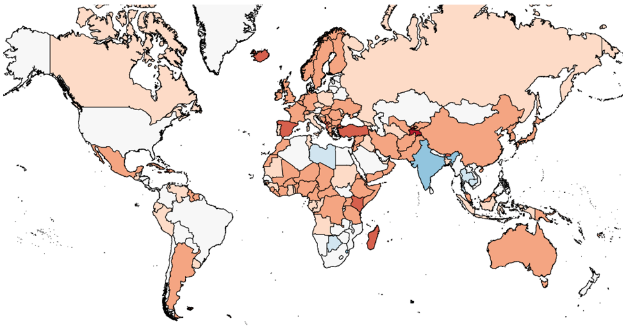
No river basins recorded unusually low maximum temperature or number of hot days. Record-high annual maximum temperatures were observed in 14 basins and record-high hot days in 12 basins. In Asia, six basins recorded record-high hot days, including the Tarim, Persian Gulf Coast and Hokkaido. In Europe, the Atlantic Iberian Coast and Black Sea South Coast recorded record highs. Three basins in Africa and one in North America also reached record-high hot days.

A further 17 basins experienced unusually high values for either variable, including the Yangtze and Huang He in Asia, four basins in South America, and several in Europe and Africa.

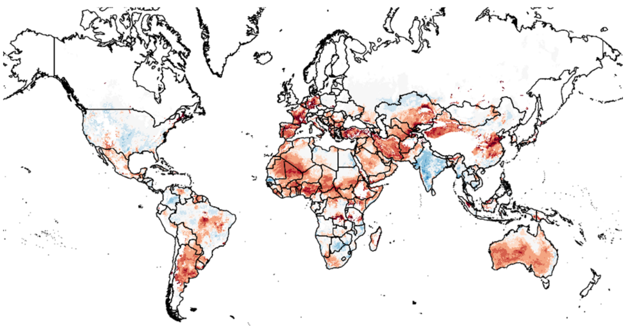
Standardised anomaly in annual maximum air temperature (see p. 9 or p. 63 for legend - note the colour scale is reversed for temperature, with red showing higher temperatures)



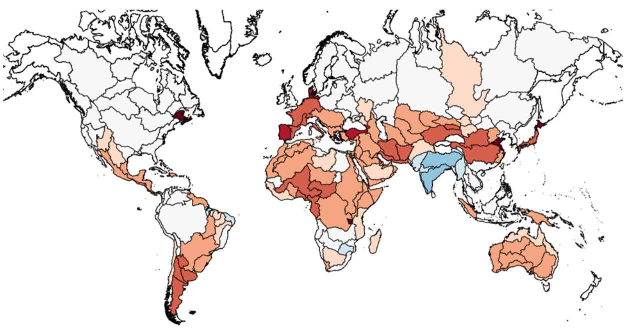
By country



Standardised anomaly in annual number of hot days



By basin



Low temperatures

Key findings

Globally, the number of frost days was 6.3% below the baseline, continuing a significant declining trend. Annual minimum temperatures are increasing.

Global averages

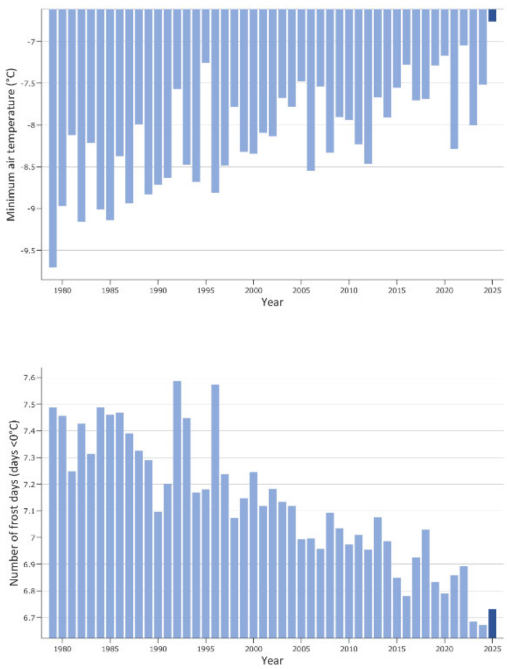
In 2025, the global average annual minimum air temperature over land was 1.25°C higher than the 1995–2005 baseline. There has been a statistically significant upward trend of 0.33°C per decade. The global number of frost days (temperatures falling below 0°C) over land was 6.3% less than for the 1995–2005 baseline, with a statistically significant downward trend of -2.2% per decade.

Record highs

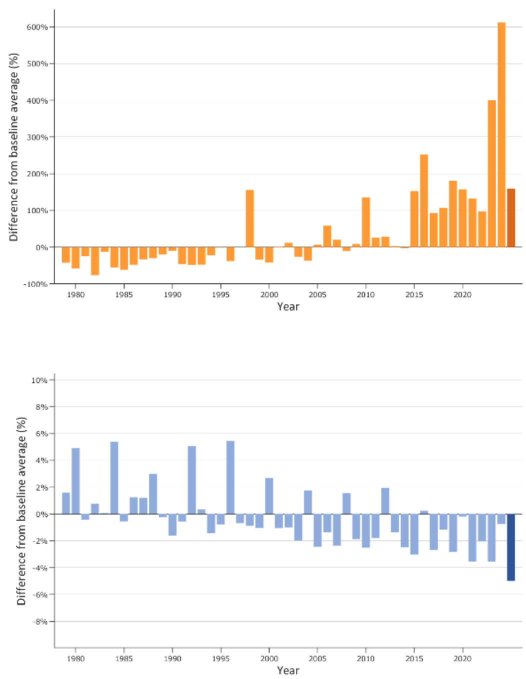
Record-high monthly minimum temperatures across 4,687 catchments worldwide were 2.9 times more frequent than during the baseline period, with a significant increasing trend of 66% per decade. Months with record-low numbers of frost days were 46% more frequent than during the baseline period, with a significant increasing trend of 8.4% per decade.

Record lows

Record-low minimum temperature months were 65% less frequent than during the baseline period, with a statistically significant decreasing trend of -42% per decade. Months with record numbers of frost days were 4.0% less frequent, with a significant decreasing trend of -1.0% per decade.



Average annual minimum temperature (top) and number of frost days (bottom) over the global land area.



Annual number of times monthly record high minimum temperature (top) and number of frost days (bottom) occurred in the time series relative to the baseline period (1995-2005).

By country

Twenty countries experienced record-high annual minimum temperatures, including three in Northern Africa (Libya, Sudan, Tunisia), Chad and Niger in the Sahel, and Eritrea in Eastern Africa. In Asia, Bangladesh, Bhutan, Nepal, Myanmar and the Philippines recorded record highs. Three Central American countries (Belize, Guatemala, Honduras) and the Dominican Republic in the Caribbean also reached record highs, as did New Zealand and Papua New Guinea in Oceania, and several small European nations. Four additional countries experienced unusually high values.

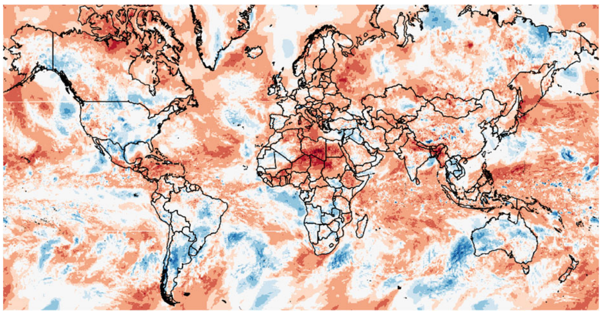
Six countries experienced record-few frost days: Ukraine in Eastern Europe, Kyrgyzstan and Tajikistan in Central Asia, Bhutan and Nepal in Southern Asia, and San Marino in Southern Europe. Three further countries experienced unusually few frost days, including India and Greece. No countries experienced unusually high numbers of frost days.

By river basin

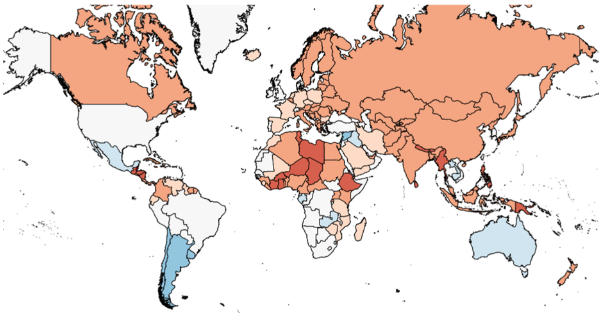
Twenty-five basins recorded record-high annual minimum temperatures. In Africa, seven basins reached record highs, including the Nile and Red Sea Coast. Seven Arctic basins also recorded record highs. In Asia, four basins including the Ganges–Brahmaputra recorded record highs, as did three basins in Europe and two in Oceania. Eight further basins experienced unusually high values, including the Volga.

Seven basins experienced record-few frost days, including the Volga in Asia, the Churchill in North America, and three basins in Europe. A further seven basins experienced unusually few frost days, including the Ganges–Brahmaputra and Ural in Asia. No basins experienced unusually high numbers of frost days.

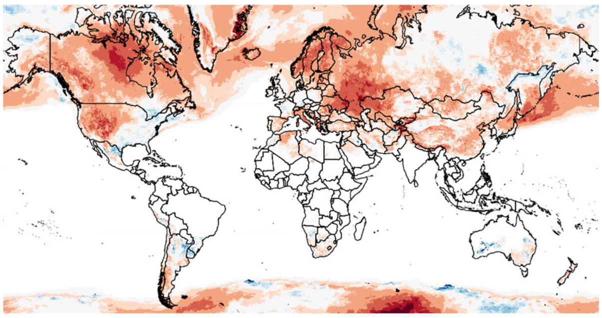
Standardised anomaly in annual minimum air temperature (see p. 9 or p. 63 for legend - note the colour scale is reversed for temperature, with red showing higher temperatures)



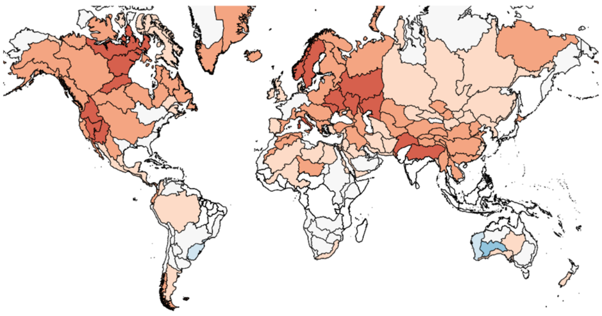
By country



Standardised anomaly in annual number of frost days.



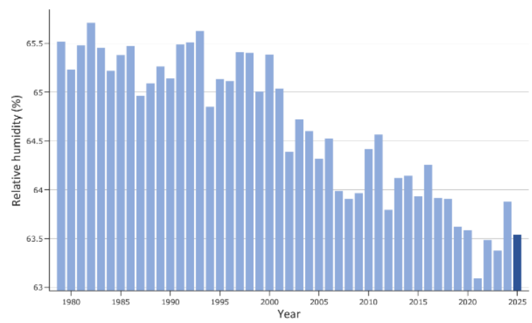
By basin



Air humidity

Key findings

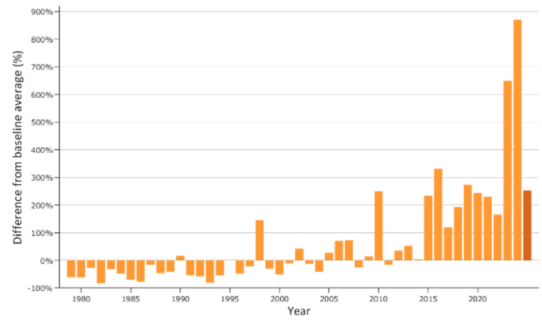
Air humidity over land continued its long-term decline, with record-low months twice more frequent than the baseline. Humidity was very low in Western Asia and parts of Africa.



Annual average air humidity over the global land area

Global averages

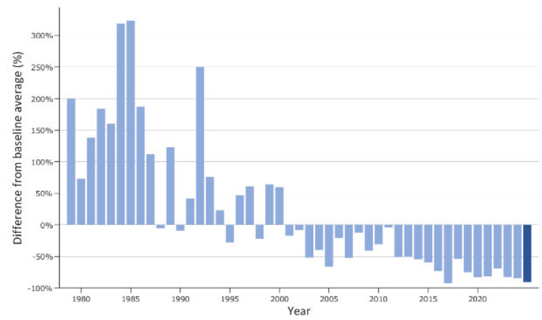
The global average relative air humidity over land was 63.5% in 2025, lower than the 1995–2005 baseline of 65.0%. There is a statistically significant long-term decline of approximately 0.5% per decade (-0.8% relative to the baseline average). The trend towards drier air has been attributed to a more rapid rise in air temperature over land than over sea[9].



The number of times low monthly air humidity records were broken compared to the average for 1995-2005

Record lows

Record-low monthly values in 2025 across 4,687 river catchments worldwide occurred at a frequency 2.0 times higher than the baseline. The annual frequency of record-low values has been increasing at a statistically significant rate of 25% per decade. Low air humidity exacerbates drought impacts on ecosystems and people and increases the risk and severity of bushfires.



The number of times high monthly air humidity records were broken compared to the average for 1995-2005.

Record highs

Record-high monthly values were 20% lower than the baseline. There has been a statistically significant decrease of -15% per decade.

[9] Seneviratne *et al.* (2021) (link)

By country

Fourteen countries recorded record-low annual relative humidity values. In Western Asia, nine countries recorded record lows: Saudi Arabia, Iraq, Yemen, the Syrian Arab Republic, Jordan, Israel, Lebanon, Türkiye and Armenia. Kyrgyzstan and Tajikistan in Central Asia, Chile in South America, and Djibouti and Comoros in Eastern Africa also recorded record lows. Three additional countries experienced unusually low values: Iran in Southern Asia, and the Central African Republic and Uganda in Africa.

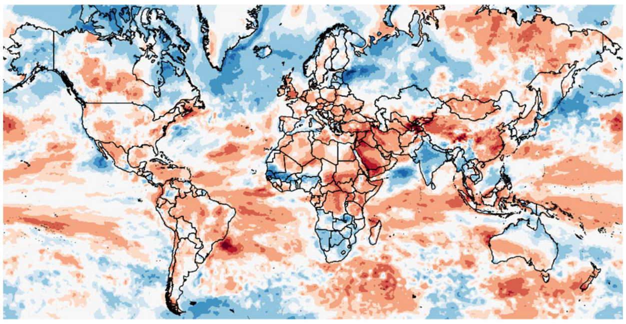
Two countries recorded record-high annual values: India in Southern Asia and Senegal in Western Africa.

By river basin

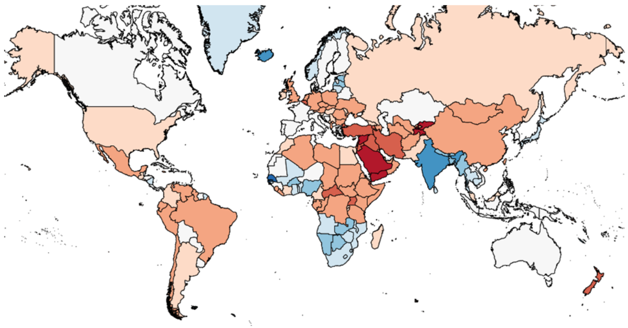
Fifteen basins recorded record-low annual values. In Asia, eleven basins reached record lows, including the Tigris–Euphrates, Jordan, Yangtze, Tarim and several basins around the Arabian Peninsula and China coast. Two basins in Africa, one in Europe and the Churchill basin in North America also recorded record lows. Eight further basins experienced unusually low values, including the Nile and Horn of Africa, the Aral–Amu Darya, and two basins in New Zealand.

Eight basins recorded record-high annual relative humidity levels. Five Arctic basins reported record highs, as did the India Arabian Sea Coast, the Senegal basin in Africa, and one basin in North America. Four additional basins showed unusually high values, including the Ganges–Brahmaputra and India Bengal Coast.

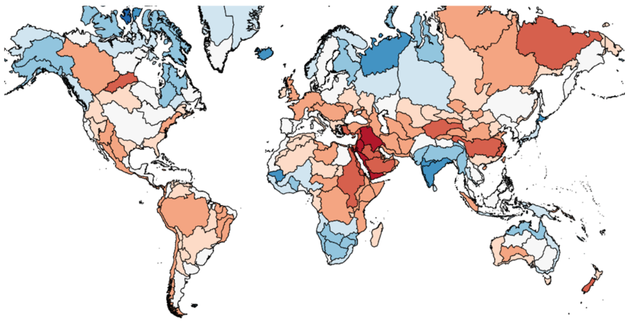
Standardised anomaly in annual average air humidity *(see p. 9 or p. 63 for legend)*



By country



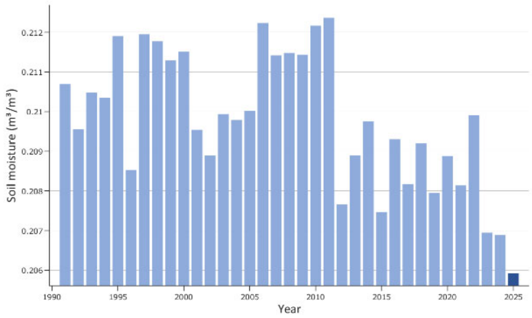
By river basin



Soil water

Key findings

Near-surface soil moisture showed strong regional contrasts, with record-low values widespread in Europe and Siberia, while parts of Asia and South America recorded highs.

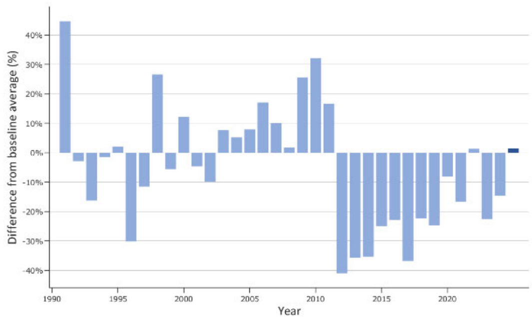


Annual soil water content over the global land area.

Global averages

The global annual average near-surface soil moisture in 2025 was 0.21 m^3/m^3, 2.2% lower than the 1995–2005 baseline. There is a statistically significant but very small declining trend of -0.48% per decade.

Satellite instruments measure soil water near the surface only, which can respond more to rainfall frequency than the total amount and can also be affected by irrigation and vegetation changes.



The number of times high monthly soil water records were broken compared to the average for 1995-2005.

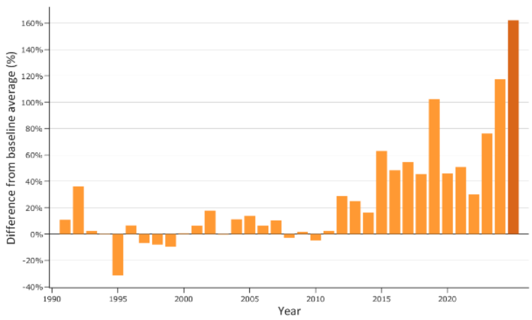
Record highs

Record-high monthly values were 1.4% more frequent, but showed a significant decreasing trend of -7.8% per decade.

Record lows

Record-low monthly values in catchments worldwide occurred 2.6 times more frequently than during the baseline, with a significant increasing trend of 28% per decade.

The record combines a series of satellite instruments, and inconsistencies between sensors may cause some of the shifts.



The number of times low monthly soil water records were broken compared to the average for 1995-2005.

By country

Sixteen countries recorded record-low annual soil moisture levels. In Europe, seven countries had record lows: Belarus, Ukraine, Czechia, Poland, Croatia, Great Britain and Sweden. Lebanon and Yemen in Western Asia also recorded record lows, as did Iran. Sudan, Djibouti and Liberia in Africa also recorded record lows, along with Canada, Chile and Jamaica in the Americas.

Seven further countries experienced unusually low values: Bulgaria, Hungary, Germany and Finland in Europe, Nigeria and Somalia in Africa, and Suriname in South America.

Two countries recorded record-high annual soil moisture: Cyprus in Europe and Guinea in Western Africa. Myanmar experienced unusually high values.

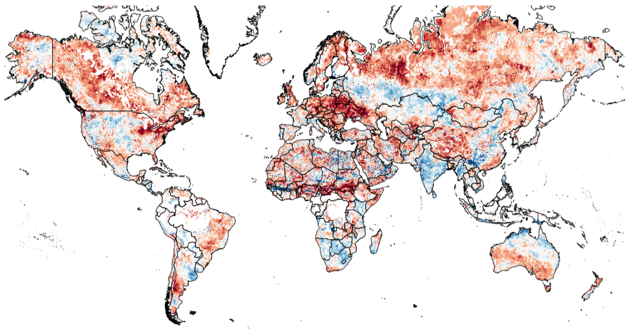
By river basin

Thirty-seven basins recorded record-low annual soil moisture. In Europe, eight basins reached record lows, including the Dnieper, England and Wales, Ireland, and several basins around the Black Sea and Baltic coasts. In Siberia, five basins recorded record lows. In Asia, six basins recorded record lows including the Plateau of Tibet. Nine basins in North America recorded record lows including the St Lawrence and several basins in eastern Canada, as did three in Africa, three in the Arctic, two in Oceania, and Patagonia in South America.

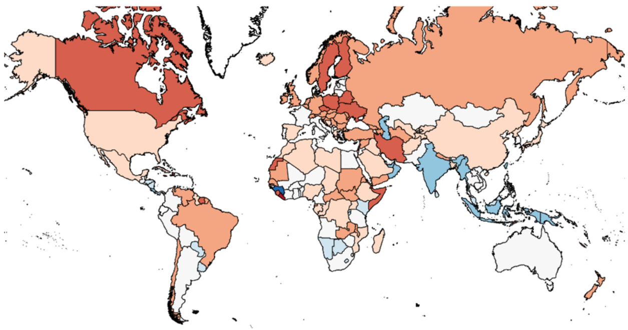
Eight further basins experienced unusually low values, including the Danube and Yenisey.

Five basins recorded record-high annual soil moisture: the La Plata basin in South America, the India Arabian Sea Coast, two basins in Indonesia (Bangko-Belitung and Java), and the Western Nile Delta in Africa.

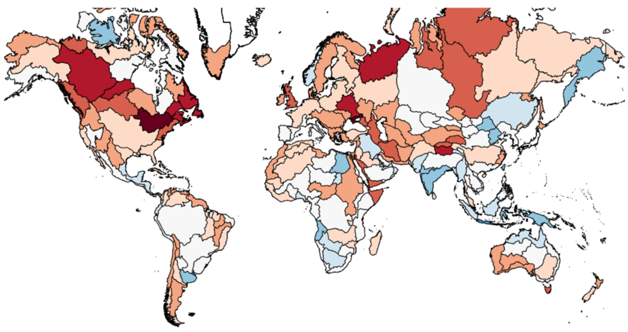
Standardised anomaly in annual average soil water content (see p. 9 or p. 63 for legend)



By country



By river basin



Vegetation condition

Key findings

Globally, vegetation greenness was 7.6% above the 2001–2005 average, continuing a steady increase. Record-high months were 5.0 times more frequent than the baseline.

Global averages

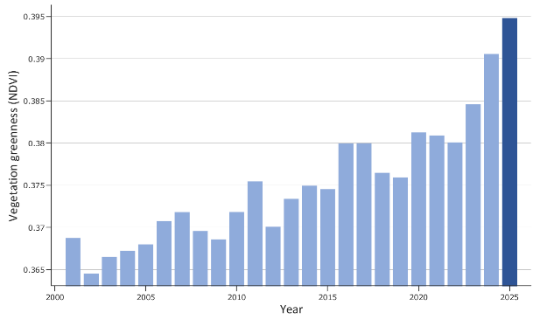
Vegetation condition (NDVI, or normalised difference vegetation index) over the land area was 7.6% above the 2001–2005 average. There has been a significant trend of vegetation condition increasing by 2.5% per decade. This trend has been attributed to a combination of increasing temperatures in cold regions, agricultural expansion, and fertilisation from increasing CO_2 and other anthropogenic sources.

Record highs

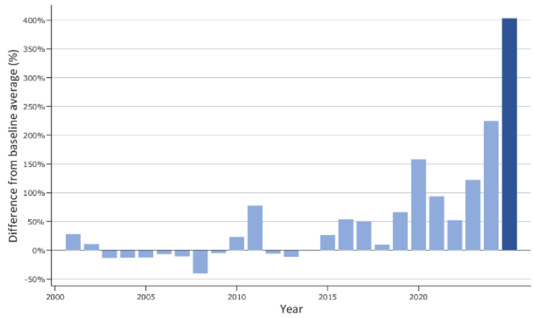
Record-high monthly values were 5.0 times more frequent, with a significant increasing trend in frequency of 90% per decade.

Record lows

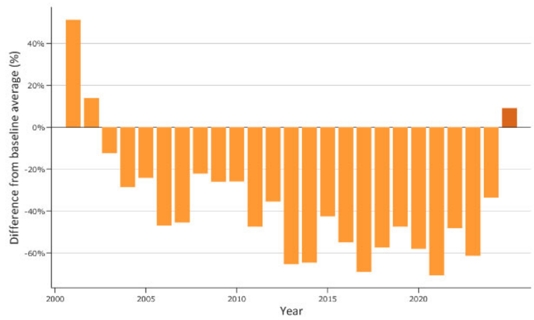
Record-low monthly NDVI values were observed 9% more frequently compared to the baseline period, but with overall a significant decreasing trend in occurrence of -20% per decade.



Annual vegetation condition (NDVI) over the global land area (in NDVI units).



The number of times high monthly vegetation condition records were broken compared to the average for 2001-2005.



The number of times low monthly vegetation condition records were broken compared to the average for 2001-2005.

By country

Four countries recorded record-low annual NDVI: Israel and the Syrian Arab Republic in Western Asia, and two small island nations (Seychelles in the Indian Ocean and Saint Vincent and the Grenadines in the Caribbean). Six further countries experienced unusually low values, including Laos in Southeast Asia, Suriname in South America, and Papua New Guinea.

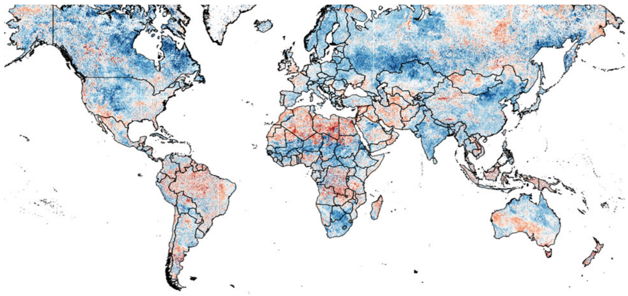
Thirty-three countries recorded record-high annual NDVI values. In Africa, ten countries recorded record highs, including five in Western Africa (Mali, Niger, Senegal, Burkina Faso, Guinea), Botswana and South Africa in Southern Africa, Sudan, Eritrea and Chad. In Asia, record highs were observed in China, Korea, India, Bangladesh, Nepal, Bhutan, Myanmar, and Kazakhstan, Kyrgyzstan and Tajikistan in Central Asia. In Europe, Russia, Belarus, Finland, Sweden, Norway, Lithuania and Italy recorded record highs. In North America, both Canada and the United States recorded record-high values. El Salvador and Haiti also reached record highs, as did Kiribati. Three further countries experienced unusually high values.

By river basin

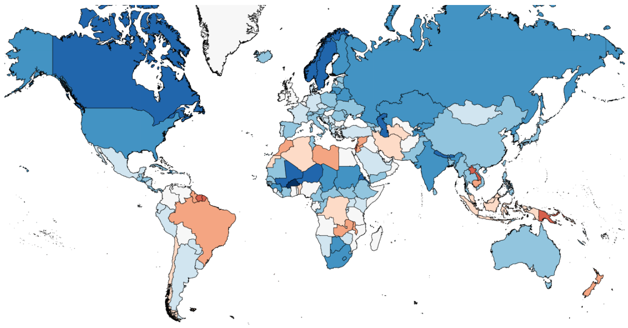
Eight basins recorded record-low NDVI values, including the Jordan basin in Asia, three basins in Africa, and four in Oceania. Four further basins experienced unusually low values.

Fifty-one basins recorded record-high NDVI values. In Asia, fourteen basins reached record highs, including the Volga, Ural, Huang He, Yangtze and Ganges–Brahmaputra. In Africa, eleven basins recorded record highs including the Niger, Volta, Lake Chad and Okavango. In North America, eight basins reached record highs including the Columbia and Nelson. In Europe, seven basins recorded record highs, and six Arctic basins also reached record highs. Eight further basins showed unusually high values, including the Nile, Mississippi–Missouri and Orange.

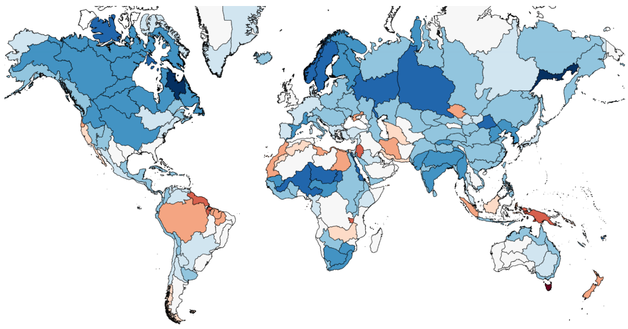
Standardised anomaly in annual average vegetation condition (see p. 9 for legend)



By country



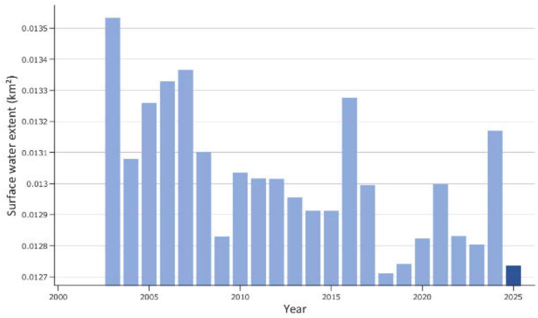
By river basin



Surface water occurrence

Key findings

Total surface water extent over land was close the baseline average. However, record-high monthly values were 26% more frequent, with a significant increasing trend of 3.8% per decade.

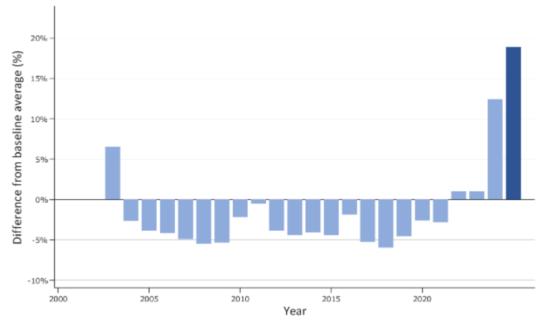


Global surface water occurrence.

Global averages

Year-to-year variations in surface water occurrence are dominated by the extent of large wetlands and lakes and the seasonal flooding of large rivers.

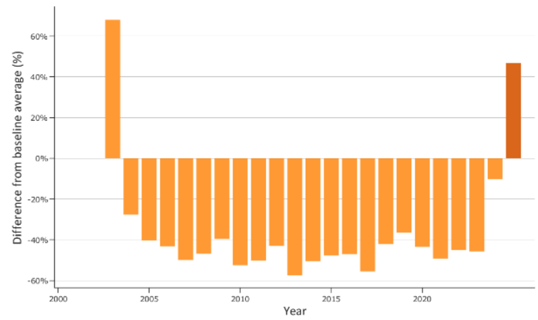
The average global surface water extent in 2025 was 4.2% below the 2003–2005 average. There has been a significant trend of -1.6% per decade, corresponding to a decline of the Caspian Sea and neighbouring lakes in Central Asia.



The number of times high monthly water occurrence records were broken compared to the average for 2003-2005.

Record highs

Record-high monthly values were 19% more frequent than during the baseline period, with a significant increasing trend of 3.8% per decade. Some changes in record water occurrence can be attributed to the construction of new dams, especially in China, India and Brazil. The remainder is associated with natural floodplains, water bodies and wetlands.



The number of times low monthly water occurrence records were broken compared to the average for 2003-2005.

Record lows

Record-low monthly values were observed 47% more frequent then for the baseline period, but there is no significant trend.

By country

Forty-nine countries recorded record-low annual surface water extent in 2025. In Europe, sixteen countries recorded record lows, including France, Austria, Switzerland, the Netherlands and several Balkan states. In Western Asia, nine countries reached record lows including Iraq, Jordan, Yemen and the UAE. South Korea in Asia, Argentina, Chile and Uruguay in South America, and several countries in Central America, the Caribbean and Africa also had record lows.

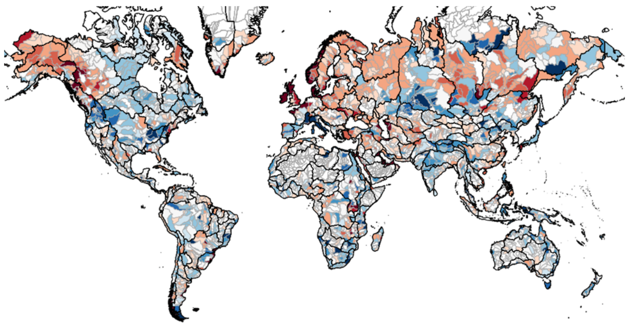
Twenty-five countries recorded record-high annual surface water extent. In Africa, record highs were observed in South Africa, South Sudan, Chad and Madagascar. In the Caribbean, four island nations reached record highs. Spain, Italy, Sweden, the Philippines and Laos also recorded record highs. A further two countries experienced extremely high values (Ethiopia and New Zealand), and another eleven experienced unusually high values, including China, Mongolia and Afghanistan.

By river basin

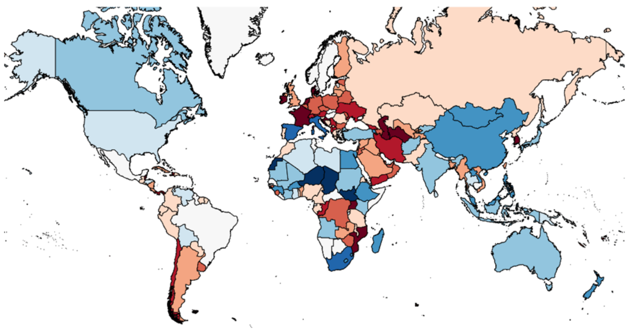
Forty-four basins recorded record-low annual surface water extent, including thirteen in Asia around the Caspian Sea, China coast and Japan; six in Europe including the Dnieper and Ireland; eight in South America including Patagonia and the Falkland Islands; six in Oceania; five in Siberia; three in the Arctic; two in North America; and Socotra in Africa.

Fifty-one basins recorded record-high surface water extent. In Africa, fourteen basins reported record highs including the Niger and Lake Chad. In Oceania, twelve basins reached record highs including the Philippines, New Zealand and Tasmania. In Asia, eight basins recorded record highs including the Huang He and India Arabian Sea Coast. In Europe, six basins reached record highs. In North America, six basins recorded record highs including the Churchill and Nelson River Basins, while five basins in South America also reached record highs.

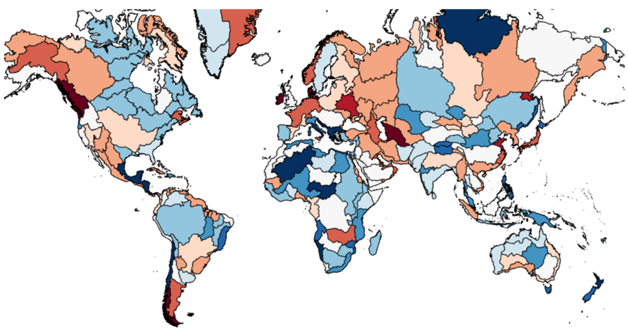
Standardised anomaly in annual surface water occurrence (see p. 9 for legend)



By country



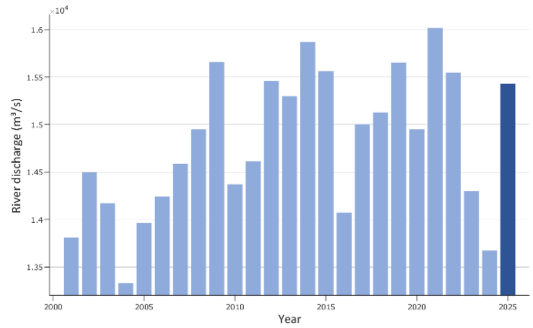
By river basin



River flows

Key findings

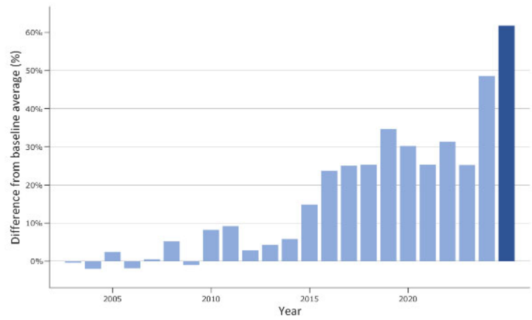
River flows were 11% above the baseline average, with record-high flows in Africa, Oceania and South America. There is a significant increasing trend of 3.3% per decade.



Global average river flows.

Global averages

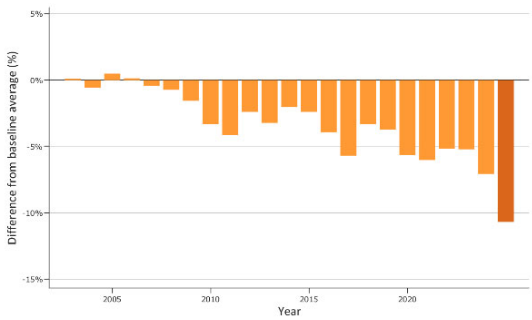
Global average river flows are dominated by rivers in the world's wettest tropical and temperate regions. Global average river flows in 2025 were 10.6% higher than the 2003−2005 baseline. There is a statistically significant increasing trend of 3.3% per decade.



The number of times high monthly river flow records were broken compared to the average for 2003-2005.

Record highs

Record-high monthly discharge values were 62% more frequent, with a significant increasing trend of 23% per decade.



The number of times low monthly river flow records were broken compared to the average for 2003-2005.

Record lows

Record-low monthly discharge values were recorded 11% less frequently than during the baseline period, with a significant decreasing trend of -3.6% per decade.

Explanations for the observed trends include increased river regulation, the impact of global warming in cold regions, and the fact that low flow records cannot be broken where zero flows have previously already occurred in that month.[10]

[10] Gudmonsson et al. (2021) Science 371, 1159-1162

By country

One country recorded record-low annual river discharge: Iceland in Northern Europe.

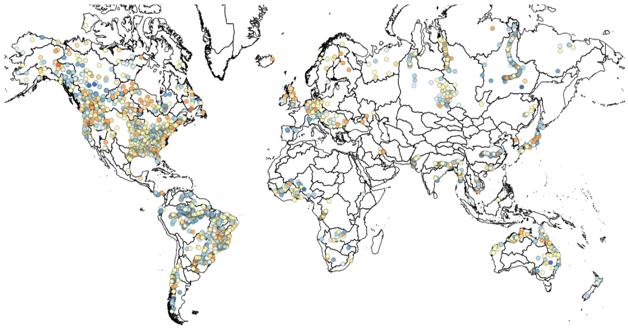
Twenty-two countries recorded record-high annual river discharge. In Western Africa, Mali, Niger, Guinea and Guinea-Bissau recorded record highs. In Eastern Africa, Ethiopia and Tanzania reached record highs, as did Algeria and Sudan in Northern Africa. In Oceania, Australia, New Zealand and Papua New Guinea recorded record highs. In South America, Ecuador, Guyana and Suriname reached record highs, as did Costa Rica and Panama in Central America. The Philippines and Sri Lanka in Asia, Mongolia and Taiwan in Eastern Asia, Saudi Arabia in Western Asia, and Russia in Europe also recorded record highs. Four further countries experienced unusually high discharge: Cameroon and Congo in Middle Africa, Guatemala in Central America, and Norway in Northern Europe.

By river basin

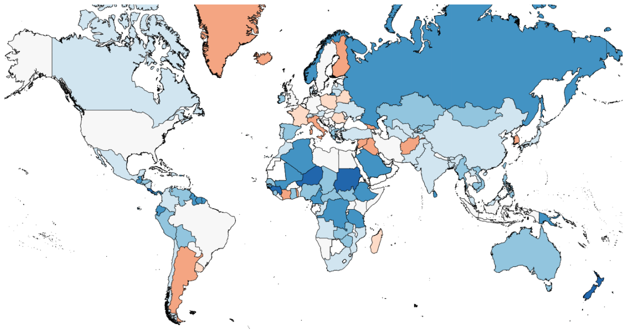
Four basins recorded record-low annual discharge: Iceland in Europe, the Tigris–Euphrates and one other basin in Asia, and one Arctic basin.

Thirty-six basins recorded record-high annual discharge. In Asia, nine basins reached record highs, including the Plateau of Tibet, Vietnam Coast and Bay of Bengal North East Coast. In Africa, eight basins recorded record highs, including the Nile, Lake Chad and Okavango. In South America, five basins reached record highs, and in Oceania, five basins including Papua and New Zealand South Island. In North America, four basins recorded record highs including the Atlantic Ocean Seaboard, and three Arctic basins also reached record highs. Three further basins experienced unusually high discharge, including the Limpopo in Africa.

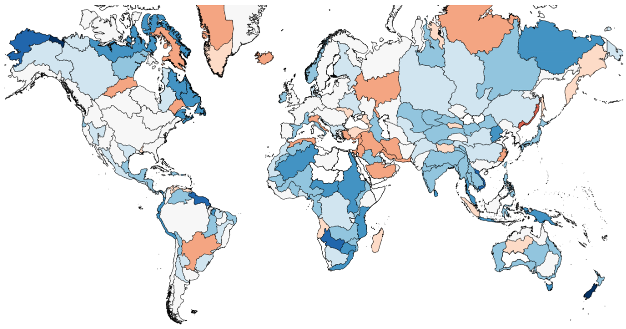
Standardised anomaly in annual average river flows in the major river(s) (see p. 9 or p. 63 for legend; estimates are not available in some smaller and arid regions.)



By country



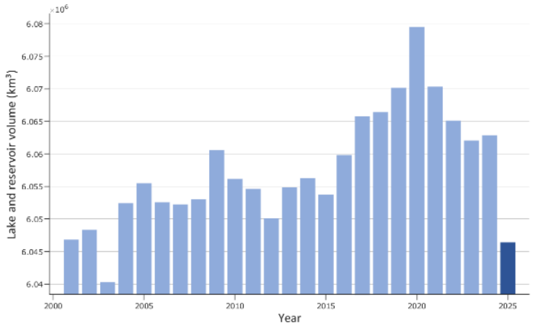
By river basin



Lake volume

Key findings

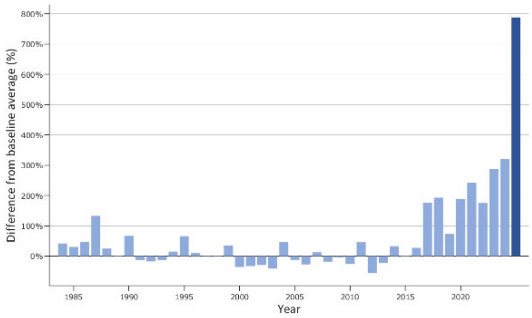
Global total lake and reservoir water volumes were close to the baseline, with record lows widespread in North America and Central Asia, and record highs in parts of Africa and Asia. There was a slight increasing trend of 0.13% per decade.



Combined water volume of global lakes

Global averages

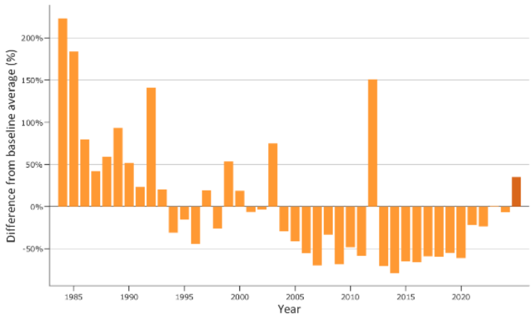
In 2025, the global average volume of water stored in water bodies was close to the 2001–2005 baseline (less than 0.1% below). There has been a significant upward trend of 0.13% per decade. About two-thirds (64%) of all water in natural and artificial lakes worldwide are found in just six countries: in descending order, Canada, the USA, China, Russia, Brazil and India. The largest number of (often small) lakes are found at high latitudes.



The number of times high monthly lake storage records were broken compared to the average for 2001-2005.

Record highs

Record-high monthly values were 8.9 times more frequent than the baseline, with a significant increasing trend of 60% per decade. This can be attributed to a combination of human and natural factors. Small and very large lakes are all counted equally. Dams are being built and expanded worldwide to secure water and their filling explains some of the trends.



The number of times low monthly lake storage records were broken compared to the average for 2001-2005.

Record lows

Record-low monthly values were 35% more frequent than during the baseline period, but there was still a significant decreasing trend of -35% per decade.

By country

Thirty-five countries recorded record-low lake volumes. In Central Asia, Tajikistan, Turkmenistan and Uzbekistan recorded record lows. In Western Asia, five countries reached record lows including Iraq, Jordan, Türkiye and the Syrian Arab Republic. In Europe, record lows were observed in four Northern European countries (Finland, Ireland, Latvia, Norway), four Eastern European countries (Bulgaria, Poland, Slovakia, Ukraine), and Albania and North Macedonia in Southern Europe. In Africa, record lows occurred in Algeria and Tunisia in Northern Africa, Madagascar, Mozambique and Zambia in Eastern Africa, Botswana in Southern Africa, and four countries in Western Africa. Canada, Japan, Mongolia, Iran, Chile, Guyana and Haiti also recorded record lows. Suriname experienced extremely low values, and three further countries experienced unusually low values.

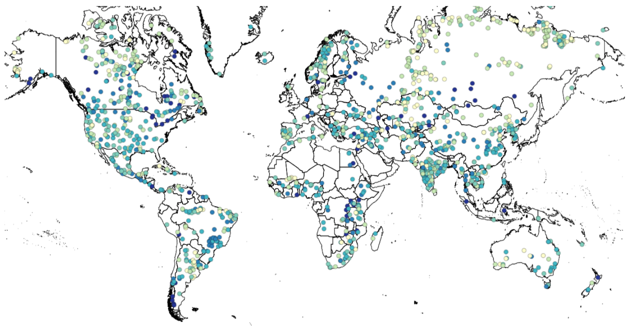
Eight countries recorded record-high lake volumes: Kenya and Tanzania in Eastern Africa, Nigeria in Western Africa, Indonesia and Laos in Southeast Asia, Taiwan in Eastern Asia, and Honduras and Nicaragua in Central America.

By river basin

Fifty-four basins recorded record-low annual lake volumes. In North America, fourteen basins reached record lows, including the Colorado, Churchill, Mississippi Coast and several around Hudson Bay. In Asia, twelve basins recorded record lows including the Volga, Yangtze, Tigris–Euphrates and Aral–Amu Darya. In Europe, eight basins recorded record lows. Five basins each in Siberia and Oceania, four in Africa, three in South America and three in the Arctic also recorded record lows. Five further basins experienced unusually or extremely low values.

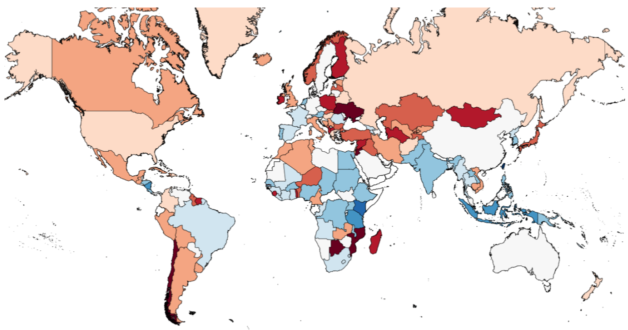
Seven basins recorded record-high annual lake volumes: the Huang He and two other basins in Asia, the Rift Valley, Lake Rukwa and Egypt Interior in Africa, and one Arctic basin. Six further basins experienced unusually or extremely high values, including the Niger and Plateau of Tibet.

Global lakes and reservoirs included in the assessment, from small (yellow) to large (blue)

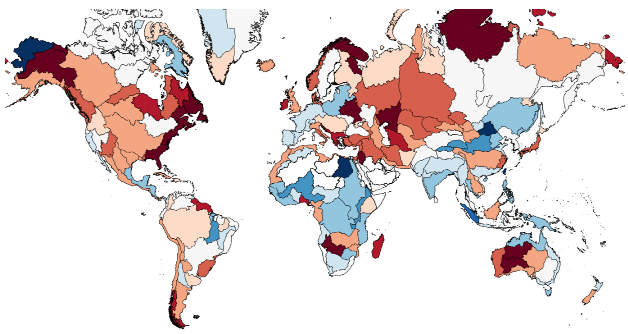


Standardised anomalies in annual average lake volume storage (see p. 9 or p. 63 for legend).

By country



By river basin



Terrestrial water storage

Key findings

Total terrestrial water storage in 2025 continued its long-term decline, with record lows in southern Europe and parts of South America, but wet conditions in Western and Eastern Africa.

Terrestrial water storage (TWS) is the sum of all water on the continents, including soil water, groundwater and surface water, snow and ice[11].

Global averages

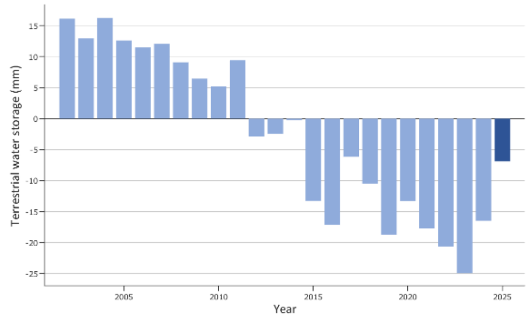
Global average terrestrial water storage continued its apparent long-term decline, with an average value of 21 mm below the 2002–2005 baseline. This represents a significant declining trend of 17 mm per decade.

Record highs

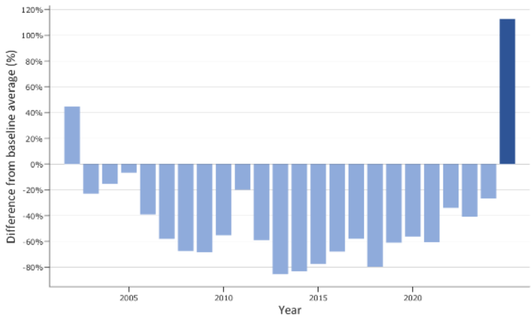
Record-high monthly values occurred 2.1 times more frequently, but there is no significant trend.

Record lows

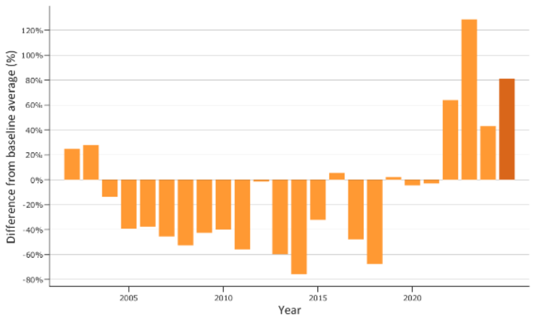
Record-low monthly values were observed 81% more often than during the baseline period, with a significant increasing trend of 33% per decade. There appear to be increasing trends in both record high and low storage months since around 2013, but the data record is relatively short.



Annual average terrestrial water storage over the global land area.



The number of times high monthly terrestrial water storage records were broken compared to the average for 2002-2005.



The number of times low monthly terrestrial water storage records were broken compared to the average for 2002-2005.

11 Greenland and Antarctica are not included in the calculations.

By country

Fifteen countries recorded record-low annual TWS values. In Southern Europe, Greece, Serbia and North Macedonia recorded record lows, as did Bulgaria, Moldova and Romania in Eastern Europe. In Western Asia, Azerbaijan and Georgia recorded record lows, and Sri Lanka in Southern Asia. Chile and Peru in South America, Zimbabwe in Eastern Africa, and Congo and Equatorial Guinea in Middle Africa also reached record lows.

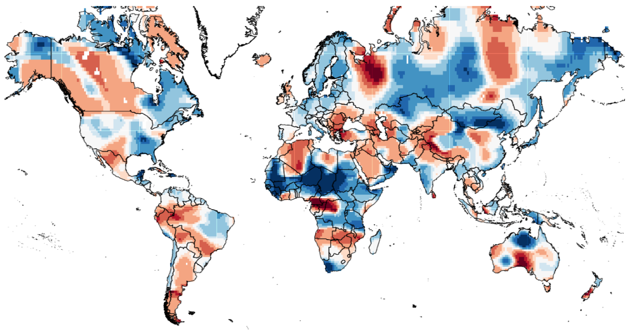
Thirty-five countries recorded record-high annual TWS values, of which 21 in Africa. In Western Africa, eleven countries recorded record highs including Nigeria, Niger, Mali, Senegal and Guinea. In Eastern Africa, seven countries recorded record highs including Uganda and Tanzania. Sudan and Egypt in Northern Africa and Chad in Middle Africa also reached record highs. Elsewhere, Japan, Mongolia and Taiwan in Eastern Asia, the United Arab Emirates and Oman, the Dominican Republic and Haiti, and several Northern and Western European countries recorded record highs. Ethiopia and Kenya experienced unusually high values[12].

By river basin

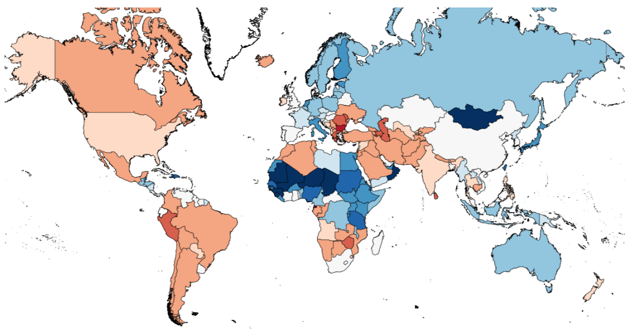
Twenty-six basins recorded record-low annual TWS values. In Asia, eight basins reached record lows including the Indus, Tarim and Plateau of Tibet. In Europe, six basins recorded record lows. In Africa, four basins recorded record lows including the Zambezi and Okavango. Three basins each in Oceania and South America, and two Arctic basins also recorded record lows. The Amazonas experienced unusually low values.

Fifty-three basins recorded record-high annual TWS values. In Asia, thirteen basins reached record highs including the India Arabian Sea Coast. In Africa, eleven basins recorded record highs including the Nile, Niger and Lake Chad. Seven Arctic basins, seven in North America, six in Siberia including the Ob and Yenisey, four in Europe, three in Oceania and two in South America also reached record highs.

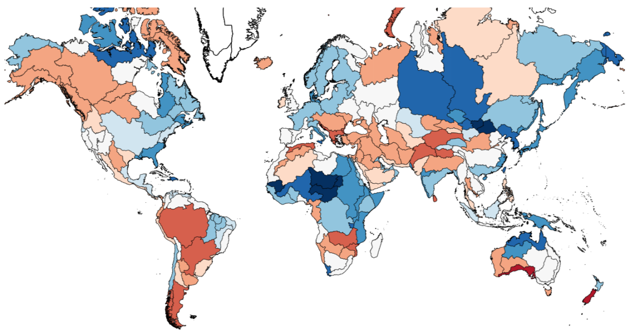
Standardised anomaly in January-September average terrestrial water storage (see p. 9 or p. 63 for legend). Note: data for Greenland not included.



By country



By river basin



[12] TWS in Northern Europe and around the Canadian Hudson Bay are affected by measurement uncertainty.

Regions in Focus

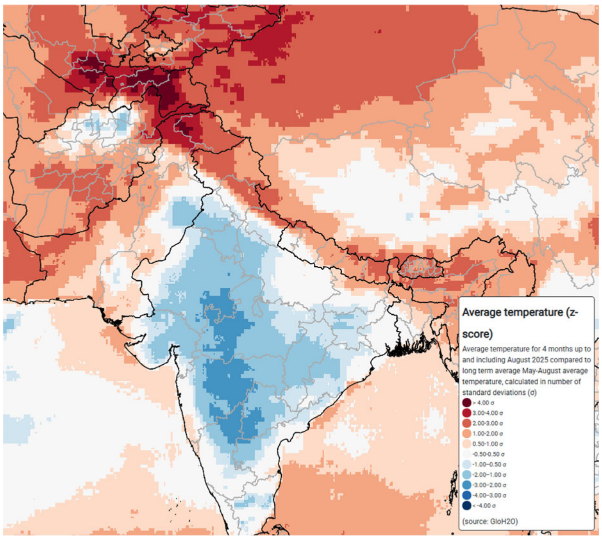
Hindu Kush Himalaya: Glacial lake outburst floods

Between May and August 2025, the Hindu Kush Himalayan region experienced an unprecedented surge in glacial lake outburst floods (GLOFs), with at least six major events striking Nepal, Afghanistan, and Pakistan within four months. According to ICIMOD, such floods historically occurred once every five to ten years—yet three struck within weeks during May–June 2025 alone, a frequency described as "completely unprecedented"[46].

The most devastating event occurred on 8 July 2025, when a supraglacial lake atop Tibet's Purepu Glacier burst, sending floodwaters down the Bhotekoshi River into Nepal. Satellite analysis revealed the lake had formed as a small pond in late December 2024 and expanded rapidly during the warmer months, reaching 638,000 square metres by 7 July before draining completely within 24 hours[47]. The flood destroyed the China-Nepal Friendship Bridge—a vital trade link—along with four hydropower projects representing approximately 200 MW of generation capacity. At least 22 people died or remain missing.

In Afghanistan, a June 2025 GLOF destroyed five villages in Baghlan province. Pakistan's Gilgit-Baltistan region was struck by multiple GLOFs in August, affecting over 300,000 people with 22 deaths reported[48].

Scientists attribute the surge to accelerating climate change driving rapid glacier retreat and creating new glacial lakes at unprecedented rates. ICIMOD projects a three-fold increase in GLOF risk across the region by the end of the 21st century. Critically, the 2025 floods originated from small, newly formed supraglacial lakes—some too small for standard satellite monitoring—rather than the larger moraine-dammed lakes that have been the focus of hazard assessments[13].



Average temperature for 4 months up to and including August 2025 compared to long-term average May-August average temperature, calculated in number of standard deviations (σ) (see also p. 63 for legend)

[13] The Himalayan Times, 9 July 2025 (link)
[14] AGU The Landslide Blog, 9 July 2025 (link)
[15] ACT Alliance, 3 September 2025 (link)

South Asia: Monsoon floods

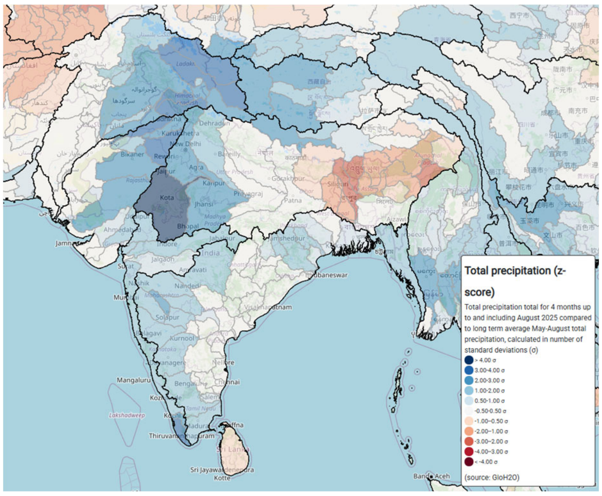
The 2025 southwest monsoon brought exceptional destruction across South Asia, claiming over 1,500 lives in India alone and affecting more than 14.6 million people in Bangladesh. India recorded 108% of its long-period average rainfall, marking the second consecutive year of above-normal monsoons. Northwest India received 27% excess rainfall—the highest since 2001—while Ladakh recorded an extraordinary 342% surplus. In contrast, East and Northeast India experienced a 20% deficit, one of the lowest since 1901[49]

The Himalayan states bore the heaviest toll. In Himachal Pradesh, the monsoon claimed 419 lives by mid-September, with total damage exceeding US$510 million. Punjab experienced its worst floods in nearly four decades, with around 1,400 villages inundated and approximately 350,000 residents affected. August proved the most destructive month, with 59 major river level breaches across nine basins, including 32 in the Ganga basin.

Bangladesh faced the worst flooding in more than 30 years in its southeastern and eastern districts. By early September, 14.6 million people had been affected, with over 500,000 displaced and more than 339,000 hectares of crops destroyed[4:].

A late-season event in early October brought further tragedy to Nepal when intense rainfall triggered landslides in the eastern district of Ilam, killing 35 people. Rivers including the Koshi surged to more than twice their normal volume, forcing authorities to open all 56 sluice gates at the Koshi Barrage[4;].

Scientists found that monsoon rainfall in Pakistan was 10–15% heavier due to human-caused climate change, with such events now expected every five years[4<].



Maximum daily precipitation for September 2025 compared to long term average September maximum daily precipitation, calculated in number of standard deviations (σ). (see also p. 63 for legend)

[16] Global Climate Risks, October 2025 (link)
[17] IFRC, September 2025 (link)
[18] Al Jazeera, 5 October 2025 (link)
[19] World Weather Attribution, August 2025 (link)

China: Northern China floods

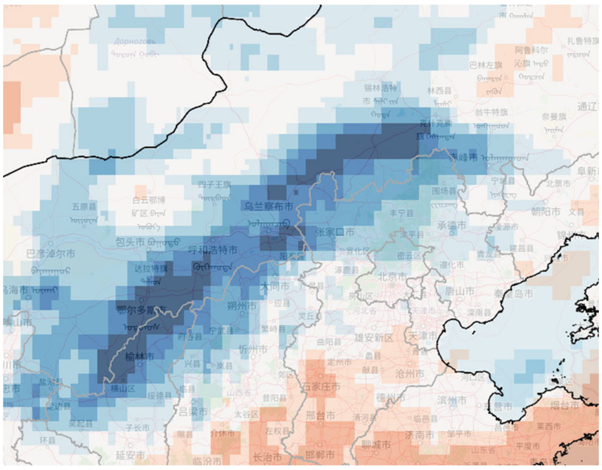
Extreme rainfall from 23 to 30 July 2025 caused catastrophic flooding across Beijing and neighbouring Hebei Province, killing at least 70 people and forcing the evacuation of more than 80,000 residents. The storms were concentrated in Beijing's mountainous northern districts, particularly Miyun, where rainfall reached 543 mm over the event period—nearly equivalent to the city's average annual precipitation[53].

The most severe loss of life occurred at an elderly care centre in Miyun District, where 31 residents drowned when floodwaters inundated the facility on 28 July. The centre housed 69 residents, of whom 55 were either fully or partially disabled. When floods struck, the Qingshui River was flowing at 1,500 times its normal volume. Floodwaters rose rapidly to 2 metres depth, trapping residents who were unable to escape. Rescuers saved 48 people[54].

In total, 44 people died in Beijing, with 16 deaths in Hebei Province and 10 in Shanxi Province. The Miyun Reservoir, Beijing's primary water supply, recorded its highest inflow since construction in 1959—peaking at 6,550 cubic metres per second. Authorities released water to prevent overtopping[55].

Analysis revealed that by 27–28 July, soils across the basin had reached saturation, meaning rainfall converted directly into surface runoff—explaining the rapid escalation of flooding[56].

Officials issued a rare public apology for the nursing home deaths, acknowledging that the facility had not been included in evacuation plans because it was historically considered safe — described as a "bitter lesson" exposing vulnerabilities in emergency preparedness for ageing populations facing increasingly frequent extreme weather[20].



Maximum daily precipitation for July 2025 compared to long term average July precipitation, calculated in number of standard deviations (σ). (see also p. 63 for legend)

[20] Al Jazeera, 31 July 2025 (link)
[21] Global Times, 31 July 2025 (link)
[22] China Daily, 31 July 2025 (link)
[23] Spire Global, 23 October 2025 (link)

South Korea: Record rainfall and flooding

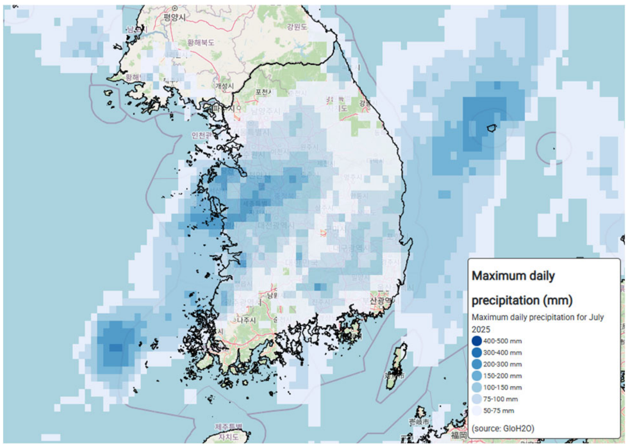
Three separate periods of intense rainfall in July and August 2025 caused devastating flooding across South Korea, killing at least 23 people with nine others reported missing. The Korea Meteorological Administration described the July event as a "once-in-a-century" occurrence, with some regions recording their heaviest hourly rainfall since records began in 1904[24].

The first and most destructive period began on 16 July and continued for five days. In Seosan in South Chungcheong Province, hourly rainfall peaked at 115 mm—a level the weather agency said had not been recorded in 121 years. The worst-affected area was Sancheong County in the southeast, where nearly 800 mm of rain fell over five days, far exceeding typical monsoon levels. Ten people died in the rural county, with four others missing[25].

Over 41,000 properties lost power as electrical infrastructure succumbed to floodwaters and landslide damage. Approximately 14,575 people were evacuated across 15 provinces. President Lee Jae-myung declared six provinces special disaster zones, directing that "all government assistance must be mobilised"[26].

A second wave struck between 3 and 4 August. In Muan County, 290 mm fell in 24 hours, with hourly rainfall peaking at 142.1 mm—a level classified as a once-in-200-years event. One person was killed and over 2,500 evacuated[27].

While South Korea typically maintains strong disaster preparedness, many communities were caught off guard as the monsoon arrived later than forecast, highlighting the increasing unpredictability of extreme weather linked to climate change.



Maximum daily precipitation for July 2025.

[24] Phys.org, 17 July 2025 (link)
[25] Al Jazeera, 20 July 2025 (link)
[26] The Watchers, 20 July 2025 (link)
[27] Korea Herald, 4 August 2025 (link)

Vietnam: Three typhoons in three weeks

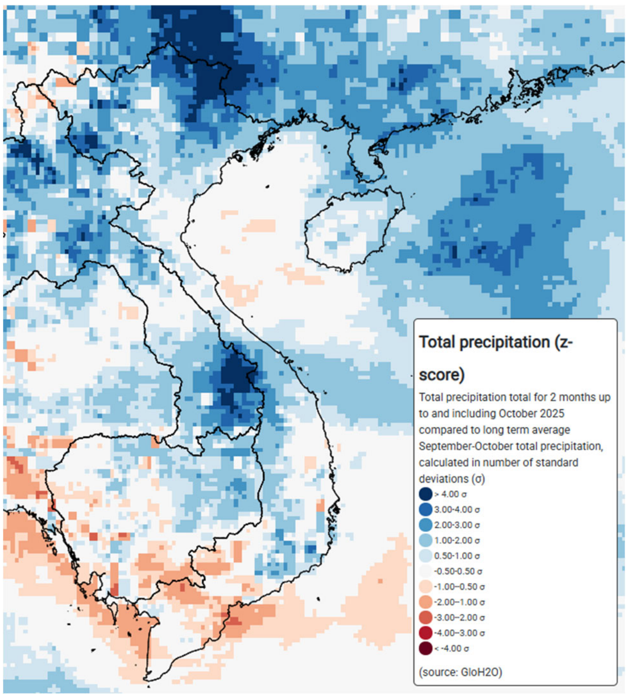
Three major typhoons struck Vietnam in rapid succession between late September and mid-October 2025, triggering devastating floods across northern and north-central regions. The combined impacts of Typhoons Ragasa, Bualoi, and Matmo killed 85 people, left 11 missing, and caused economic losses estimated at 43.5 trillion VND (US$1.73 billion)[5;].

Super Typhoon Ragasa—ranked the strongest storm worldwide in 2025—peaked with winds of 267 km/h before dissipating over northern Vietnam on 25 September.[5<]

Days later, Typhoon Bualoi made landfall in Hà Tĩnh province on 29 September, bringing winds of 133 km/h and remaining over land for more than 12 hours. Bualoi proved the most destructive, killing 57 people with 10 missing and 172 injured. More than 169,000 houses were damaged and over 80,600 hectares of crops destroyed, with economic losses reaching nearly 24 trillion VND (US$954 million)[63].

Before the country could recover, Typhoon Matmo struck on 6–7 October. On 7 October, the Bắc Khê 1 hydropower dam in Lạng Sơn province partially collapsed after water flow surged to over 1,500 m^3/s. Authorities evacuated 200 families downstream, preventing casualties[64].

River levels rose rapidly, with many reaching Alert Level 3—Vietnam's highest threshold. In Thái Nguyên, flood levels exceeded the 2024 record by 1.09 metres. More than 546,000 houses were damaged or submerged, and over 2.5 million schoolchildren were affected[65].



Total precipitation total for 2 months up to and including October 2025 compared to long term average September-October total precipitation, calculated in number of standard deviations (σ) (see also p. 63 for legend)

[28] UN OCHA, 12 November 2025 (link)
[29] CNN, 22 September 2025 (link)
[30] CBC News, 29 September 2025 (link)
[31] The Watchers, 8 October 2025 (link)
[32] VnExpress, 9 October 2025 (link)

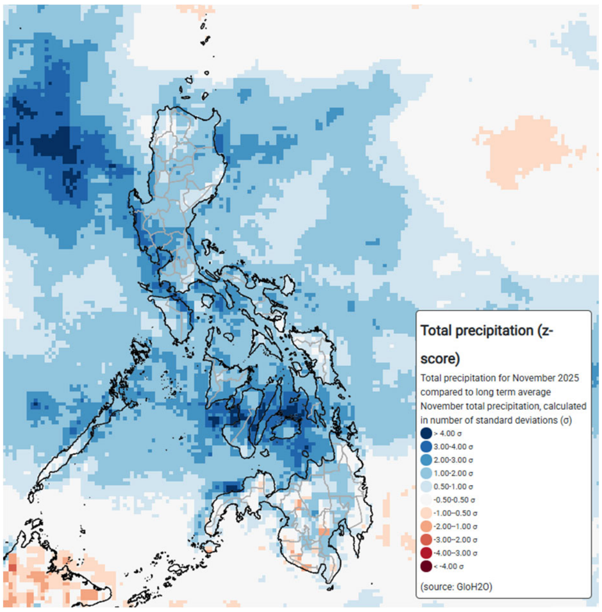
Philippines: Back-to-back typhoons

Two major typhoons struck the Philippines within five days in early November 2025, killing at least 297 people combined, displacing millions, and prompting President Ferdinand Marcos Jr. to declare a state of national emergency. Typhoons Kalmaegi and Fung-wong together affected approximately 13 million people across nearly the entire archipelago[33].

Typhoon Kalmaegi made landfall in Southern Leyte just before midnight on 3 November, then crossed the central Visayas with sustained winds of 150 km/h. In the 24 hours before landfall, the area around Cebu City received 183 mm of rainfall—well in excess of its 131 mm monthly average. The rainfall triggered catastrophic flash flooding, particularly in highly urbanised areas. Kalmaegi killed 269 people, with 150 deaths in Cebu alone. A Philippine Air Force helicopter crashed during disaster response operations, killing all six crew[34].

Cebu was still recovering from a magnitude-6.9 earthquake on 30 September that had killed at least 79 people. Officials attributed the flooding severity partly to years of quarrying that clogged rivers—amid a corruption scandal involving defective flood control projects[35].

Before the country could recover, Super Typhoon Fung-wong made landfall in Aurora province on 9 November with sustained winds of 185 km/h and an exceptionally wide diameter of approximately 1,800 km that affected 16 of 18 regions. More than 1.5 million people were preemptively evacuated—one of the largest peacetime evacuations in Philippine history. Fung-wong killed at least 33 people[36].



Total precipitation for November 2025 compared to long term average November total precipitation, calculated in number of standard deviations (σ)

[33] UN OCHA, 20 November 2025 (link)
[34] Al Jazeera, 5 November 2025 (link)
[35] NPR, 6 November 2025 (link)
[36] CNN, 10 November 2025 (link)

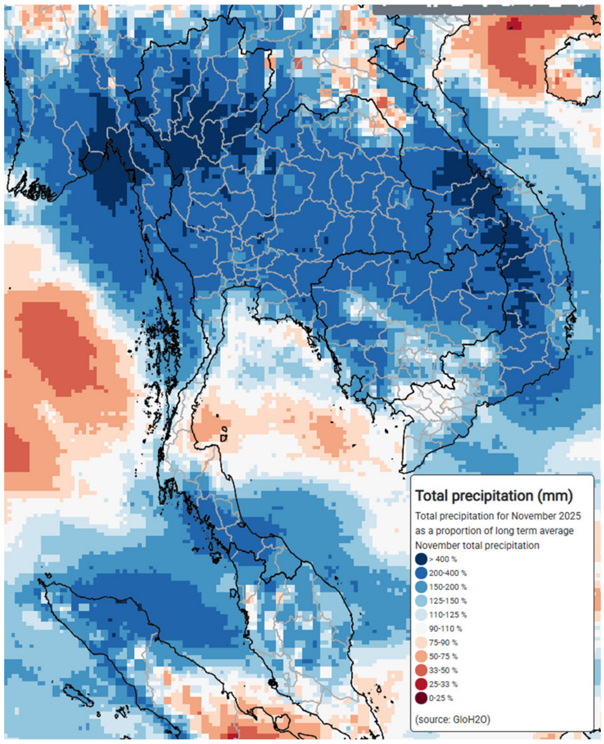
Thailand and Malaysia: Once-in-300-years rainfall devastates southern region

The rare Cyclonic Storm Senyar, combined with an intensified northeast monsoon and La Niña conditions, caused devastating flooding across southern Thailand and Peninsular Malaysia in late November 2025. At least 263 people died in Thailand—with local rescue workers suggesting the toll in Songkhla province may be 550–1,000—while Malaysia reported 3 deaths and evacuated over 34,000 residents[37].

The city of Hat Yai in Songkhla province recorded 335 mm of rain on 21 November—described by the Royal Irrigation Department as the heaviest daily rainfall in at least 300 years. The three-day deluge dumped 635 mm on the region, with floodwaters reaching depths of up to two metres. At Hat Yai Hospital, nurses cared for 30 newborn babies in a maternity ward on the third floor with electricity and water partially cut off. The flooding trapped 7,000 foreign tourists and prompted the government to declare Songkhla a disaster zone[38].

Songkhla province bore the brunt of the disaster, with at least 200 of Thailand's 263 confirmed deaths concentrated there. Flooding affected 3.6 million people in 1.2 million homes across 20 southern provinces. The Royal Thai Navy deployed 14 vessels, including an aircraft carrier to provide aid[39].

Senyar was only the second documented tropical cyclone in the Strait of Malacca after Tropical Storm Vamei in 2001—an exceptionally rare equatorial cyclone aided by warm seas and cross-equatorial flow. The UN warned that such events reflect a broader shift toward more intense and unpredictable weather across the Asia-Pacific[40].



Total precipitation for November 2025 as a proportion of long term average November total precipitation (see also p. 63 for legend)

[37] The Watchers, 28 November 2025 (link)
[38] CNN, 25 November 2025 (link)
[39] Al Jazeera, 28 November 2025 (link)
[40] UN News, December 2025 (link)

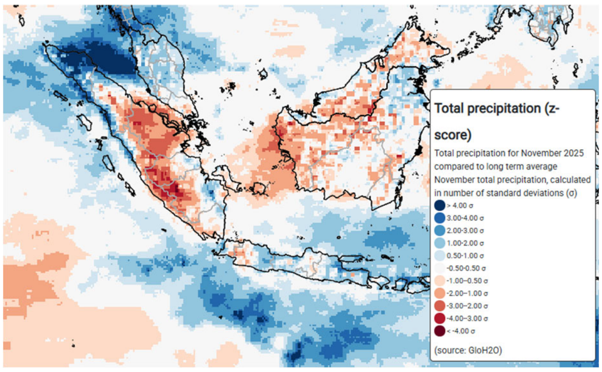
Indonesia: Rare equatorial cyclone causes catastrophic flooding in Sumatra

Cyclonic Storm Senyar—the second documented tropical cyclone to form in the Strait of Malacca since records began—triggered catastrophic flooding across northern Sumatra in late November 2025, killing over 1,000 people and becoming Indonesia's deadliest natural disaster since the 2018 Sulawesi earthquake and tsunami[41].

Senyar developed on 22 November and intensified into a cyclonic storm despite forming less than five degrees north of the equator, where the Coriolis effect is normally too weak for cyclone organisation[41]. The storm made landfall near midnight on 26 November, dropping nearly 400 millimetres of rain over mountainous terrain[1]. Readings in Lhokseumawe showed 130 millimetres in three hours[42].

The deluge devastated three provinces. North Sumatra recorded 283 deaths; West Sumatra lost 165, including 120 in Agam Regency; Aceh suffered 156 deaths with 46,000 homes damaged after a 150kV transmission tower collapsed[3]. Major roads were paralysed by floods up to three metres deep[43]. Over 3.3 million people were affected, with 570,000 sheltering in evacuation centres[41].

Reconstruction costs exceed US$3 billion[42]. The government suspended activity in the Batang Toru watershed, identifying industrial forestry, hydropower development, and gold mining as factors that worsened flooding[42]. Scientists noted that decades of deforestation have eliminated natural water retention, converting heavy rain into deadly flash floods[42].



Total precipitation for November 2025 compared to long term average November total precipitation, calculated in number of standard deviations (σ)

[41] NASA Science, 4 December 2025 (link)
[42] Mongabay, 9 December 2025 (link)
[43] PBS News, 28 November 2025 (link)

Sri Lanka: Deadliest disaster since the 2004 tsunami devastates the island

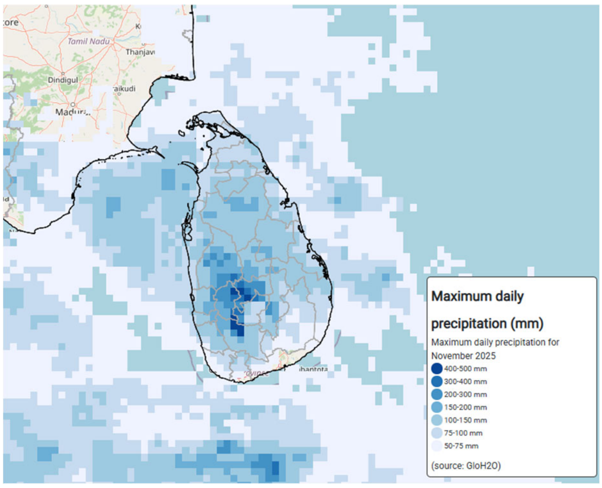
Cyclonic Storm Ditwah struck Sri Lanka on 28 November 2025, killing at least 640 people—the deadliest natural disaster since the 2004 tsunami[44]. Over two million people were affected, with economic losses of US$4.1 billion (4 per cent of GDP)[45].

Ditwah formed unusually close to the equator in waters warmed to 28–30°C[46]. The slow-moving cyclone crossed the island, discharging 490–540 millimetres of rain over 72 hours, with 350+ millimetres in 24 hours in many areas[44]. Disaster officials described resulting floods as levels not experienced in recent history[44].

The central highlands suffered worst. Kandy District recorded 234 deaths; Badulla 90; Nuwara Eliya 89[46]. Approximately 1,200 landslides occurred across the interior[44]. The Kelani River burst its banks, inundating Colombo's suburbs for days, displacing 175,000 from Kolonnawa alone[3].

Infrastructure damage was extensive: over 200 roads impassable, 10+ bridges damaged, two-thirds of railway lines unusable, power outages affecting 30 per cent of the country[44]. An estimated 86,000 houses were damaged or destroyed[46]. India launched Operation Sagar Bandhu, deploying aircraft carrier INS Vikrant and delivering 53+ tonnes of relief materials[46].

A World Weather Attribution study found climate change made heavy precipitation 28–160 per cent more intense[447]. The disaster exposed longstanding vulnerabilities including unregulated hillside development and inadequate urban drainage[44].



Maximum daily precipitation for November 2025

[44] UN News, 30 November 2025 (link)
[45] World Bank, 22 December 2025 (link)
[46] WHO, 2 December 2025 (link)
[47] World Weather Attribution, December 2025 (link)

Zambia: Power crisis persists as agriculture recovers from drought

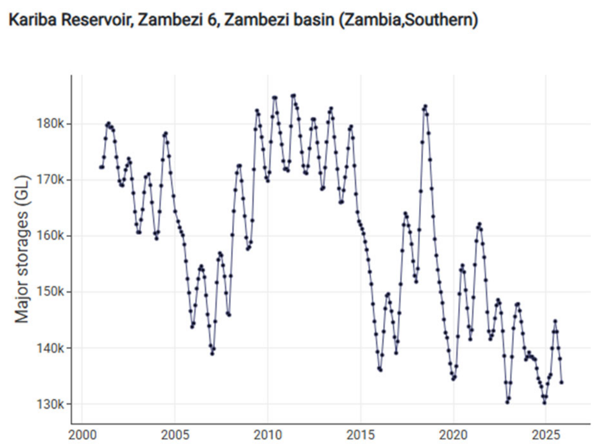
The dual food and energy crises triggered by southern Africa's worst drought in a century followed divergent paths through 2025. Agricultural production rebounded dramatically with La Niña rains, but the hydropower crisis proved stubborn, with blackouts persisting as Lake Kariba struggled to recover.

Zambia's maize harvest surged from 1.5 million tonnes in the drought-devastated 2023/24 season to 3.66 million tonnes—a 142 per cent increase transforming the country from importer to exporter[48]. With domestic consumption of 2.8 million tonnes, Zambia recorded a surplus exceeding 500,000 tonnes[48]. Zimbabwe similarly recorded improved harvests.

The electricity situation was starkly different. In February 2025, Lake Kariba's usable storage stood at just 6.31 per cent—down from 16.28 per cent in 2024[49]. By November, actual generation had fallen to 1,469 megawatts against demand of 2,600 megawatts—a deficit exceeding 1,000 megawatts[50]. "Stage 11 load management" left households with just three hours of electricity daily.

The crisis devastated small and medium enterprises, which comprise 97 per cent of Zambian firms and generate 70 per cent of GDP[51]. A survey found businesses lost roughly 50 per cent of expected 2024 output[51]. Diesel generators cost US$0.45 per kilowatt-hour—ten times the grid tariff[51]. Zimbabwe faced 16–18 hour daily load-shedding; a nationwide blackout struck 3 July 2025[52].

Zambia accelerated its solar pivot, targeting 1,000 megawatts by end 2025[50]. The divergent recovery highlighted different time scales: agriculture rebounded within one season, while reservoir storage requires sustained inflows over multiple years.



Monthly time series of Kariba Reservoir storage

[48] Zambia Statistics Agency, May 2025 (link)
[49] Zambezi River Authority, February 2025 (link)
[50] Zambian Observer, November 2025 (link)
[51] M&J Zambia, May 2025 (link)
[52] FairPlanet, May 2025 (link)

Horn of Africa: New drought emergency undoes recovery

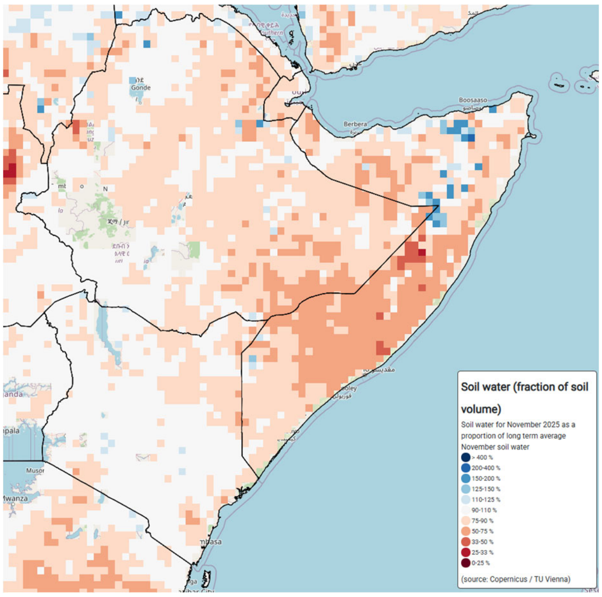
Just two years after the devastating 2021–2023 drought—the worst in over 40 years—a new emergency unfolded across Somalia, Kenya, and Ethiopia in 2025. On 10 November, Somalia declared a national drought emergency[53]; Kenya reported deteriorating conditions in 20 of 23 arid counties[54].

La Niña conditions and a negative Indian Ocean Dipole—the same pattern that triggered severe droughts in 2010 and 2022—suppressed rainfall[55]. The October–December 2024 short rains failed, and March–May 2025 rains arrived late and below average[4]. By late November, many Somali areas had received less than 30 per cent of average rainfall[56].

In Somalia, 4.4 million people faced acute food insecurity by late 2025, with 921,000 in emergency conditions. An estimated 1.85 million children under five faced acute malnutrition through July 2026[57]. Kenya reported 2.1+ million facing acute hunger[54]. The drought devastated pastoral livelihoods: water trucking costs in Gedo rose from US$2.50 to US$6 per 200-litre barrel[53]. In Somaliland, rain failures forced over 45,000 students to drop out as families migrated seeking water[53].

The crisis unfolded amid unprecedented funding collapse. Somalia's 2025 Humanitarian Response Plan was only 23.7 per cent funded (US$337 million of US$1.42 billion)[53]. The World Food Programme slashed assistance from 2.2 million recipients in 2024 to just 350,000 by November—fewer than one in ten needing aid[53].

Despite constraints, Kenya Red Cross activated its Early Action Protocol in September 2025—the first pre-emptive humanitarian measures[658]. The UN allocated US$10 million from the Central Emergency Response Fund for drought early action[53].



Soil water for November 2025 as a proportion of long-term average November soil water.

[53] OCHA Somalia, 27 November 2025 (link)
[54] Kenya NDMA, February 2025 (link)
[55] ICPAC Climate Watch, November 2025 (link)
[56] FEWS NET Somalia, November 2025 (link)
[57] IPC Somalia, September 2025 (link)
[58] IFRC, September 2025 (link)

South Africa: Eastern Cape floods

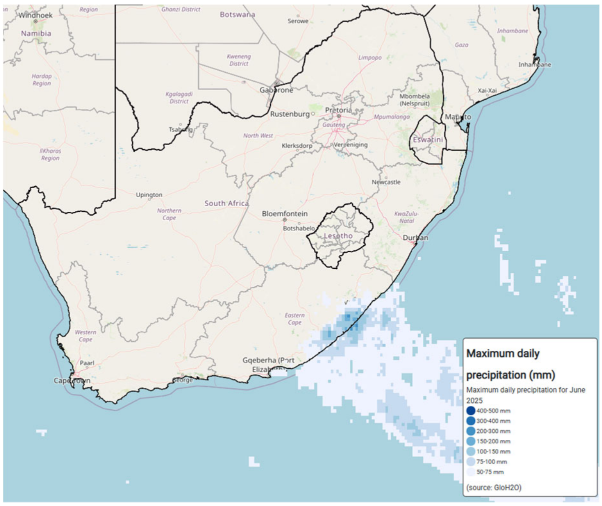
A powerful winter storm system brought torrential rain, gale-force winds, and snow to South Africa's Eastern Cape Province from 9 to 10 June 2025, causing rivers to burst their banks and producing floodwaters up to 3–4 metres deep[1]. The disaster killed at least 103 people—including 32 school children—and left nearly 5,000 homeless in one of the country's poorest provinces[8<].

The flooding was triggered by an intense cut-off low pressure system[93]. Several towns including Mthatha, Gqeberha, and East London received more than 200 millimetres in under 48 hours[94]. Floodwaters swept through communities in predawn hours, carrying away homes, vehicles, and people; victims were found up to 2 kilometres from where they had been[95]. A school bus was swept away attempting to cross a flooded bridge, killing eight including six students[59].

The death toll comprised 50 males and 53 females, including 63 adults and 40 children; the youngest victim was 12 months old[59]. OR Tambo District accounted for 77 deaths (75 per cent of total). By early July, 4,724 people were homeless and 2,145 dwellings partially damaged, with 6,869 households affected[59].

Rescue efforts were hampered by limited resources. The largely rural Eastern Cape, home to 7.2 million people, had only one rescue helicopter available locally, deployed from Gqeberha more than 500 kilometres away[96]. Infrastructure damage was extensive: 127+ schools and 20+ healthcare facilities damaged, with repair costs estimated at R5.1 billion (US$288 million)[59].

On 18 June, authorities declared a national disaster[59]. Scientists noted warmer Indian Ocean temperatures add moisture to the atmosphere and strengthen storms affecting the region[60].



Maximum daily precipitation for June 2025.

[59] SAnews, 27 June 2025 (link)
[60] Daily Maverick, 18 June 2025 (link)
[61] World Weather Online, 15 June 2025 (link)
[62] Washington Post, 13 June 2025 (link)
[63] PBS NewsHour / AP, 12 June 2025 (link)

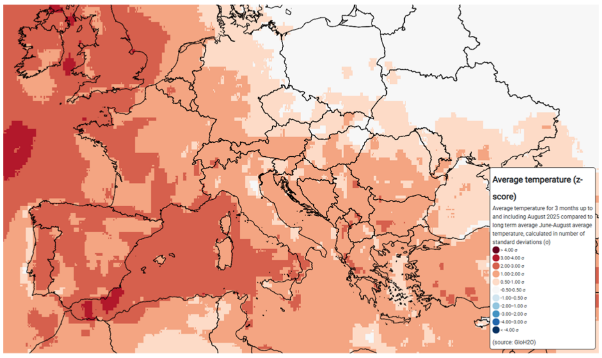
Europe: Summer heatwave

Multiple heatwaves struck Europe between April and September 2025, resulting in an estimated 24,400 heat-related deaths across 854 cities—approximately 16,500 (68 per cent) directly attributable to human-caused climate change [64]. The sustained warmth made 2025 the fourth-warmest summer on record for the continent.

The most extreme temperatures occurred during heatwaves in June and early July. On 28 June, El Granado in Spain reached 46.0°C, breaking the national June record; Mora in Portugal recorded 46.6°C[65]. On 30 June, daily average temperatures across western Europe reached 24.9°C, a new June record[65]. The UK recorded its warmest summer ever at 16.10°C; such summers are now 70 times more likely due to greenhouse gas emissions[66]. Spain, Portugal and Ireland also recorded their hottest summers on record[65].

A rapid attribution study of the 23 June–2 July heatwave estimated 2,300 deaths across 12 cities during those 10 days, with climate change responsible for 65 per cent—tripling the toll compared to a world without warming. The heatwave was 2–4°C hotter than without climate change[67]. People aged 65+ accounted for 88 per cent of deaths[64].

For the full summer, climate change increased daily temperatures by an average of 2.2°C, with peaks of 3.6°C[64]. The highest death tolls attributable to climate change were Italy (4,597), Spain (2,841), Germany (1,477), France (1,444), and UK (1,147)[64]. Western Mediterranean sea surface temperatures reached 27.0°C on 30 June, the highest June value on record[2].



Average temperature for 3 months up to and including August 2025 compared to long term average June-August average temperature, calculated in number of standard deviations (σ).

[64] LSHTM, 18 September 2025 (link)
[65] Copernicus Climate Change Service, July 2025 (link)
[66] Met Office, 1 September 2025 (link)
[67] Imperial College London, July 2025 (link)

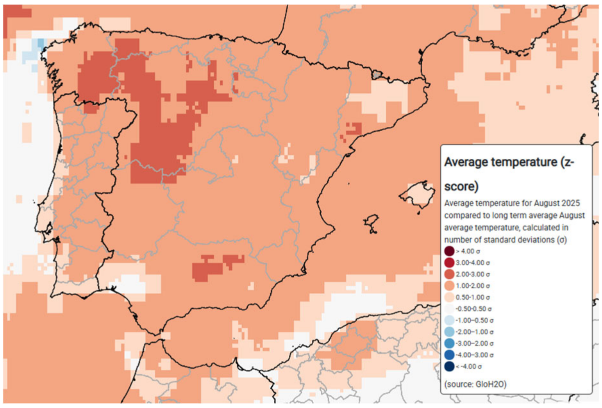
Spain and Portugal: Iberian Peninsula wildfires

Spain and Portugal experienced one of their worst wildfire seasons on record in August 2025, as record-breaking heat, flash drought, and strong winds created explosive fire conditions. More than 640,000 hectares burned—roughly four times the size of Greater London—accounting for two-thirds of Europe's total burned area[68].

The fires were preceded by Spain's most intense heatwave since records began. From 3 to 18 August, temperatures averaged 4.6°C above threshold, with 8–17 August the hottest consecutive ten days since 1950. Summer 2025 was Spain's warmest on record at 24.2°C[69]. The conditions demonstrated "hydroclimate whiplash": wet spring spurred vegetation growth, then flash drought dried it rapidly, creating ideal fuel[68].

In Spain, approximately 380,000 hectares burned—a record nearly five times the 2006–2024 average—concentrated in Galicia, Castilla y León, and Extremadura. In Portugal, 260,000+ hectares burned (2.3 per cent of national land area)[68]. Eight people died directly; over 1,100 Spanish deaths were attributed to the August heatwave[70]. The EU Civil Protection Mechanism was activated 17 times—more than total 2024 activations[68].

A World Weather Attribution study found climate change made fire-prone conditions 40 times more likely and 30 per cent more intense. Without climate change, such conditions would occur once every 500 years; with 1.3°C warming, they occur approximately once every 15 years. The 10-day heatwave was 200 times more likely and 3°C hotter due to warming[68].



Average temperature for August 2025 compared to long term average August average temperature, calculated in number of standard deviations (σ) (see p. 63 for legend)

[68] World Weather Attribution, 4 September 2025 (link)
[69] AEMET / Al Jazeera, 24 August 2025 (link)
[70] Carlos III Health Institute, August 2025 (link)

California, USA: Los Angeles wildfires expose urban water system vulnerabilities

The most destructive wildfire event in Los Angeles County history erupted on 7 January 2025, when multiple blazes ignited amid hurricane-force Santa Ana winds gusting up to 160 km/h. The fires killed at least 30 people, forced over 200,000 to evacuate, and destroyed 16,000+ structures across 14 fires before the two largest were contained on 31 January[71].

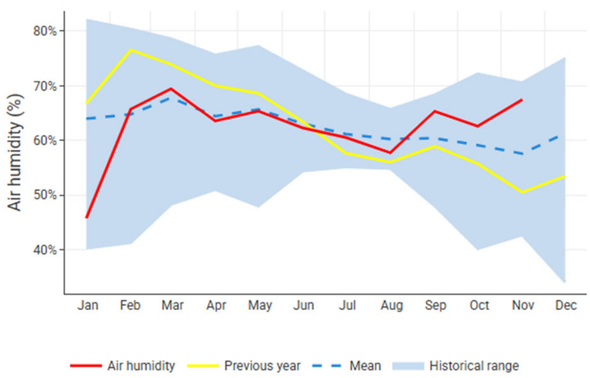
The Palisades Fire consumed 23,448 acres, destroying 6,837 structures and killing 12. The Eaton Fire burned 14,021 acres, destroying 9,414 structures and killing 18—the deadliest blaze. Actual deaths may approach 440 when accounting for excess mortality from smoke and disrupted healthcare[71].

Following wet winters that produced abundant vegetation and California's hottest summer on record, autumn rains failed—Los Angeles received much below rainfall since October 2024[72].

Firefighting was severely hampered by water supply failures. By 3 a.m. on 8 January, all three one-million-gallon tanks serving Pacific Palisades had run dry[73]. The 117-million-gallon Santa Ynez Reservoir remained offline for repairs since February 2024[74]. The city's water utility acknowledged the system was "designed to put out house fires, not multiple neighbourhoods on fire"[75].

Insured losses reached US$40 billion—the costliest wildfire globally. The total economic impact was estimated US$250–275 billion[76].

Scientists found climate change made fire-prone conditions 35 per cent more likely and 6 per cent more intense. The dry season has lengthened by 23 days due to warming, increasing overlap with peak Santa Ana winds[77].



Year-on-year air humidity in the Los Angeles metropolitan area

[71] Cal Fire / Britannica, January 2025 (link)
[72] Scripps Oceanography, January 2025 (link)
[73] NPR, 8 January 2025 (link)
[74] CBS News, 14 January 2025 (link)
[75] National Geographic, January 2025 (link)
[76] AccuWeather / Gallagher Re, July 2025 (link)
[77] World Weather Attribution, January 2025 (link)

Southeastern USA: Spring tornado outbreaks and flooding

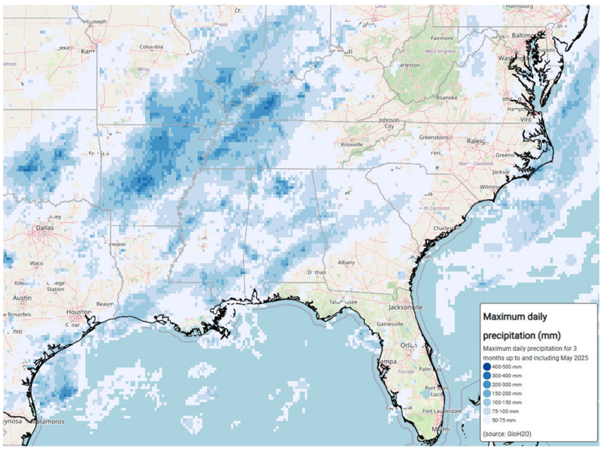
Spring 2025 brought one of the most active severe weather seasons in recent US history. Major tornado outbreaks from March through May, accompanied by historic flooding across the Mississippi River Valley, killed at least 70 people and caused over US$50 billion in losses[78].

March 2025 set a record with 300 confirmed tornadoes—shattering the previous March record of 192 (2012) by 56 per cent[79]. The largest outbreak (13–16 March) produced 115+ tornadoes across a dozen states. Three EF4 tornadoes struck, with the Diaz, Arkansas tornado reaching 306 km/h winds. An EF4 in Mississippi tracked 108 km over 82 minutes, killing five[80]. March damage totalled US$9.5 billion[78].

The 2–7 April storm system triggered catastrophic flooding across the Central Mississippi Valley. Rainfall of 200–300 mm fell over four days—the heaviest spring rainfall on record since 1950[81]. Little Rock received 300 mm; Mayfield, Kentucky recorded 340 mm[80]. Seven died in Kentucky flooding including a nine-year-old swept away walking to a school bus[82]. The outbreak produced 157 tornadoes and killed 24 people (9 tornado, 15 flood), with US$4.1 billion damage[80].

A World Weather Attribution analysis found climate change made April rainfall 9 per cent more intense and 40 per cent more likely, with Gulf of Mexico temperatures 1.2°C above normal[81].

The 15–16 May outbreak produced 60 tornadoes. An EF4 tracked 97 km through Kentucky over 90 minutes at 274 km/h winds, killing 19—the deadliest US tornado since December 2021[81]. May damage reached US$9–16 billion[83]. By mid-year, 960+ tornadoes had been recorded—40 per cent above the 15-year average[79].



Maximum daily precipitation for 3 months up to and including May 2025.

[78] Yale Climate Connections, 22 July 2025 (link)
[79] NOAA Climate.gov, May 2025 (link)
[80] Center for Disaster Philanthropy, October 2025 (link)
[81] World Weather Attribution, May 2025 (link)
[82] NPR, 6 April 2025 (link)
[83] Reinsurance News, 22 May 2025 (link)

Texas, USA: Flash floods

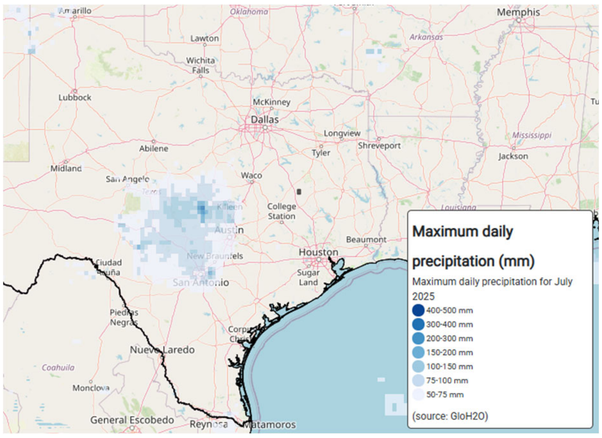
Catastrophic flash flooding struck the Texas Hill Country on 4 July 2025, killing at least 135 people in the state's deadliest freshwater flood event in over a century. The Guadalupe River rose approximately 8 metres in 45 minutes, inundating communities as residents slept[84].

The flooding was caused by a mesoscale convective vortex interacting with remnant moisture from Tropical Storm Barry[85]. The slow-moving system produced extreme rainfall over steep limestone terrain with shallow soils that absorb water poorly—a region known as "Flash Flood Alley"[84]. Approximately 130–280 mm of rain fell in affected areas, with some locations receiving up to 460 mm in hours—four months of typical rainfall[86]. At Hunt, the river gauge recorded a rise from 4.3 to 8.8 metres in under two hours before failing; it crested at 11.4 metres—the highest ever recorded[1].

Kerr County bore the heaviest toll with 117 deaths including 28 children[84]. Camp Mystic, a summer camp located on the South Fork Guadalupe within a FEMA-designated floodway, lost 27 campers and staff when floodwaters surged through before dawn[87]. The storm struck during a holiday weekend when many visitors were camping near the river. Additional fatalities occurred in Travis (9), Burnet (5), Williamson (3), and Tom Green (1) counties[84].

The disaster exposed critical warning gaps. The National Weather Service issued 22 alerts including a flash flood emergency at 4:03 a.m.[88] However, Kerr County lacked an independent warning system and issued no local alerts[84]. The nearby town of Comfort, operating automated sirens linked to NWS, reported no casualties[84].

Research found meteorological conditions were up to 7 per cent wetter than the past due to climate change[89]. The Texas legislature allocated US$240 million for disaster relief and warning infrastructure[790].



Maximum daily precipitation for July 2025

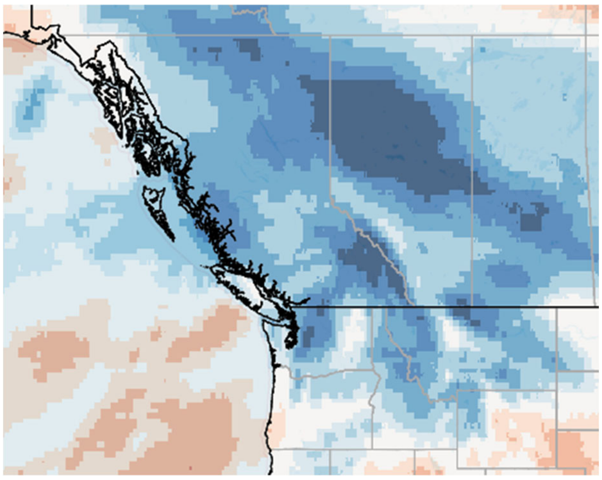
[84] Wikipedia / NBC News, July 2025 (link)
[85] Yale Climate Connections, 6 July 2025 (link)
[86] TIME / UN News, July 2025 (link)
[87] NPR, 7 July 2025 (link)
[88] CBS News, 7 July 2025 (link)
[89] ClimaMeter, 7 July 2025 (link)
[90] NPR, 23 September 2025 (link)

USA / Canada: Pacific Northwest atmospheric river floods

Beginning 8 December 2025, a Category 5 atmospheric river triggered severe flooding across western Washington State and British Columbia's Fraser Valley. The moisture plume stretched 11,000 km from near the Philippines[91]. Back-to-back storms through 18 December deposited nearly 600 mm of rain in parts of the Cascade Range, breaking flood records on multiple rivers—including the Skagit, Snohomish, Cedar, and Nooksack—that had stood since 1990[92].

Up to 100,000 people faced evacuation orders in Washington; 460 properties were ordered evacuated in Abbotsford, British Columbia[93,94]. Two levees failed near Seattle; two homes collapsed into the Nooksack River. Over 1,200 rescues were conducted across 14 counties. Several highways sustained extensive damage, with repairs expected to take months[93].

One flood-related death occurred in Washington; one storm-related death in British Columbia[95]. Low mortality was attributed to effective early warnings and high evacuation compliance. However, this was the third major Nooksack River overflow into Sumas Prairie since 2020—replicating the 2021 event that caused over C$1 billion (US$700 million) in damages[96].



Total precipitation total for December 2025 compared to long term December total precipitation, calculated in number of standard deviations (σ)

[91] NASA Earth Observatory, December 2025 (link)
[92] National Weather Service Seattle, December 2025 (link)
[93] Washington State Emergency Management Division, December 2025 (link)
[94] City of Abbotsford, December 2025 (link)
[95] Snohomish County Sheriff's Office / OPB, December 2025 (link)
[96] Province of British Columbia, Nooksack-Sumas Transboundary Flood Initiative (link)

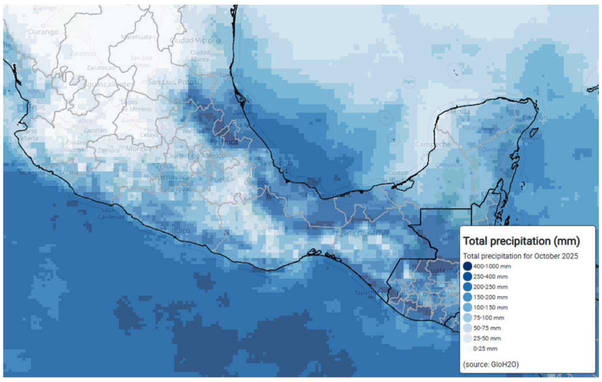
Mexico: Eastern coast flooding

Severe flooding and landslides struck eastern and central Mexico between 6 and 11 October 2025, killing at least 76 people and leaving approximately 75 missing across five states. The disaster was caused by converging moisture from Hurricane Priscilla, Tropical Storm Raymond, and Atlantic Tropical Disturbance 90-E[97].

Veracruz, Puebla, Hidalgo, Querétaro, and San Luis Potosí were most severely affected, with 121 municipalities impacted[97]. Veracruz recorded over 530 mm of rainfall between 6 and 9 October, 30 deaths, 18 missing, and nearly 30,000 homes damaged across 70 municipalities[98]. Poza Rica was among the hardest hit when the Cazones River overflowed, sending floodwaters exceeding 3.5 metres through low-lying neighbourhoods[99]. In Puebla, 38 municipalities sustained damage with 18 deaths. Hidalgo recorded 21 deaths and 43 missing with 16,000 homes affected[98].

The heaviest single-day rainfall occurred on 7–8 October, with Cuetzalan del Progreso in Puebla receiving 286 mm[100]. Rivers throughout the region surged over their banks. Floodwaters and landslides damaged nearly 1,000 km of roads and cut off more than 190 communities for over a week. Over 320,000 people lost electricity; approximately 100,000 homes were damaged with 7,500 displaced to 149 shelters[101].

The government deployed approximately 23,000 military and civilian personnel for rescue operations[101]. The flooding followed an unusually wet 2025 rainy season—Mexico City recorded its wettest June in over 20 years—which had already saturated soils[102]. Scientists found observational datasets and climate models showed diverging trends regarding any climate change influence, highlighting need for improved monitoring networks[99].



Total precipitation for October 2025.

[97] OCHA Flash Update No. 1, 16 October 2025 (link)
[98] Wikipedia, October 2025 (link)
[99] World Weather Attribution, November 2025 (link)
[100] Floodlist / SMN-CONAGUA, October 2025 (link)
[101] OCHA Flash Update No. 2, 21 October 2025 (link)
[102] Wikipedia, October 2025 (link)

Caribbean: Hurricane Melissa

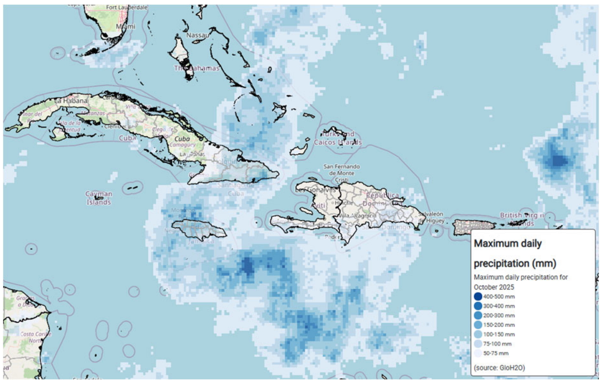
Hurricane Melissa struck the Caribbean in late October 2025 as one of the most powerful Atlantic hurricanes on record, causing catastrophic damage across Jamaica, Cuba, Haiti, and the Dominican Republic. The storm killed at least 75 people and caused economic losses estimated at US$48–52 billion[103].

Melissa made landfall on Jamaica's southern coast on 28 October as a Category 5 hurricane with maximum sustained winds of 298 km/h and central pressure of 892 hPa—tying as the third-most intense Atlantic hurricane on record and the strongest ever to strike Jamaica[104]. In the 24 hours before landfall, maximum wind speed increased by 113 km/h—extreme rapid intensification associated with warming oceans[105].

Jamaica sustained devastating damage with losses of US$8.8 billion—41 per cent of GDP—making it the costliest hurricane in the country's history[106]. Up to 90 per cent of roofs were destroyed in Black River; 77 per cent of the island lost electricity[104]. More than 1.5 million Jamaicans were affected with 25,000 displaced[107]. At least 32 died in Jamaica[104]. Rainfall reached 500–760 mm in eastern mountains[108].

The hurricane made second landfall east of Chivirico in Cuba's Santiago de Cuba province as a Category 3 storm[104]. Cuban authorities had evacuated more than 735,000 people[109]. Over 95,000 homes were damaged in Santiago de Cuba province; 241 communities remained without telecommunications a week later[110]. In Haiti, a river burst in Petit-Goâve killed 43. In the Dominican Republic, four died and 1.1 million lost water supply[104].

An attribution analysis found climate change increased Melissa's maximum wind speeds by 7 per cent and rainfall intensity by 16 per cent, making conditions for such intensity six times more likely[111].



Maximum daily precipitation for October 2025

[103] AccuWeather, October 2025 (link)
[104] Wikipedia, October 2025 (link)
[105] Climate Central, November 2025 (link)
[106] World Bank / IDB GRADE Report, 19 November 2025 (link)
[107] UN News, 7 November 2025 (link)
[108] CNN, 30 October 2025 (link)
[109] CBS News, 31 October 2025 (link)
[110] OCHA Cuba Flash Update No. 5, 5 November 2025 (link)
[111] World Weather Attribution, November 2025 (link)

Australia: Queensland floods and melioidosis outbreak

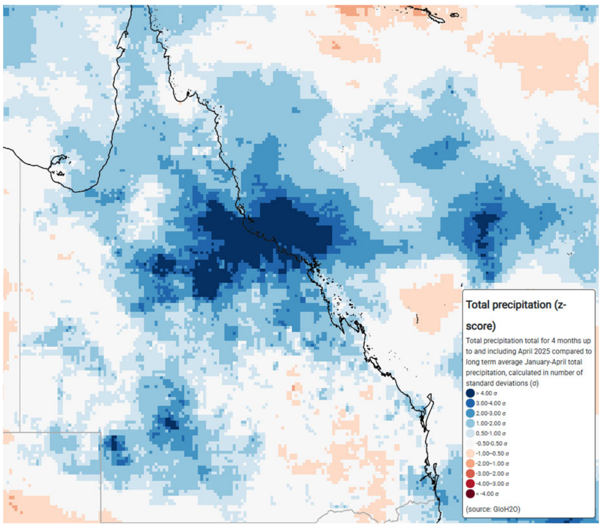
From late January through April 2025, northeastern Queensland experienced severe flooding that killed at least two people directly, triggered an unprecedented melioidosis outbreak claiming 31 additional lives, and caused economic damage exceeding AUD 1.2 billion (approximately USD 780 million)[112].

The disaster began on 29 January when two tropical lows formed near north Queensland, producing rainfall the Bureau of Meteorology compared to cyclonic conditions despite never officially forming into cyclones. By 2 February, some areas received over 1,000 mm; Paluma recorded 175+ mm in three hours. Ingham areas recorded over 600 mm in 24 hours[112]. By mid-February, Townsville had recorded 1,150 mm in 15 days—the wettest month in recorded history, exceeding the previous 1953 record[113].

The Herbert River rose to 14.89 metres, approaching the historic 1967 record of 15.2 metres. Ross River Dam reached 163.8 per cent capacity[112]. Two people died directly: a 63-year-old woman when a rescue boat capsized, and an 82-year-old woman found in a cane paddock. Over 8,000 homes lost power; the Bruce Highway Ollera Creek Bridge collapsed, requiring Australian Defence Force repairs[114].

The flooding triggered Australia's largest melioidosis outbreak. By mid-May, Queensland Health recorded 221 cases and 31 deaths—a 400 per cent increase in Cairns and 600 per cent increase in Townsville compared to average years[115]. The bacterium *Burkholderia pseudomallei* normally lives in soil but becomes dangerous when brought to surface by heavy rainfall. [116].

Western Queensland experienced subsequent flooding from 21 March to 19 May, with towns including Stonehenge and Windorah surpassing 1974 flood heights. Over 15,000 residents were displaced across 24 local government areas[117].



Total precipitation total for 4 months up to and including April 2025 compared to long term average January-April total precipitation, calculated in number of standard deviations (σ)

[112] Wikipedia, February 2025 (link)
[113] World Socialist Web Site, 22 February 2025 (link)
[114] Mongabay, 4 February 2025 (link)
[115] The Conversation, May 2025 (link)
[116] Scimex, 26 February 2025 (link)
[117] DisasterAssist.gov.au, May 2025 (link)

2025 in Context: Disasters and impacts

In 2025, water-related disasters caused nearly 5,000 deaths, displaced around 8 million people, and resulted in economic losses exceeding US$360 billion globally. Actual impacts were likely higher due to incomplete reporting. Losses arose from tropical cyclones, floods, heatwaves, droughts and wildfires, often occurring in quick succession or in areas already under strain.

The scale of impacts in 2025 was similar to other recent high-impact years, even though several physical indicators did not reach new global records. This shows that recent losses are increasingly shaped by exposure, preparedness and infrastructure, rather than by record-breaking climate conditions alone.

Fatalities and displacement

Tropical cyclones were among the deadliest hazards in 2025. Cyclone Senyar killed more than 1,000 people in Indonesia, while Cyclone Ditwah caused 640 deaths in Sri Lanka, making it the country's deadliest disaster since 2004. In both cases, deaths were driven by intense rainfall affecting highly exposed populations in areas with limited prior experience of severe cyclone flooding.

Extreme heat also caused widespread loss of life. Across Europe, summer heatwaves were linked to an estimated 24,400 heat-related deaths, with attribution studies indicating that around two-thirds were due to climate change.

Flooding led to large-scale displacement across several regions. Monsoon floods affected more than 14 million people in Bangladesh. In the Philippines, successive typhoons forced the evacuation of about 1.5 million people and disrupted the lives of more than 13 million. In the Horn of Africa, a new drought emergency emerged before communities had recovered from the 2021–2023 crisis.

Food security

Water-related disasters affected food security in several regions. In Somalia, prolonged drought left about 4.4 million people facing acute food insecurity, while humanitarian funding covered only 24 per cent of identified needs. In contrast, parts of southern Africa experienced improved agricultural conditions following the 2024 drought, showing how outcomes varied depending on prior conditions and response capacity.

Economic losses and infrastructure

Economic losses in 2025 were among the highest recorded. The Los Angeles wildfires caused insured losses of around US$40 billion, making them the most expensive wildfire event in global insurance history. Losses were worsened by heat and drought, which placed heavy demand on urban water systems and limited firefighting capacity.

In the Caribbean, Hurricane Melissa caused an estimated US$48–52 billion in damage, including losses equal to about 41 per cent of Jamaica's GDP. Across the Iberian Peninsula, wildfires burned around 640,000 hectares, nearly five times Spain's recent average.

Infrastructure weaknesses were a recurring factor. In Los Angeles, water systems designed for past conditions were unable to meet demand during multiple neighbourhood-scale fires. In Zambia and Zimbabwe, low water levels in Lake Kariba limited hydropower generation despite improved rainfall, leaving households with as little as three hours of electricity per day during 2025.

Timeline of Events. *Figures are based on available reports as of 27 December 2025. Death tolls and displacement figures continue to evolve. Economic losses marked N/A where comprehensive estimates are not yet available. Drought events span multiple years (2023–2025) reflecting ongoing conditions. See sections on individual events for details and sources.*

Date	Location, Event	Fatalities	Displaced	Economic Loss (US$)
January	Zambia – Drought-caused power crisis	–	–	N/A
January	California, USA – Winter Wildfires	30	200,000	250 billion
January-April	Australia – Queensland floods and disease outbreak	33	15,000	780 million
March-May	USA – Spring tornado outbreaks and flooding	70	N/A	50 billion
May–August	Hindu Kush Himalaya – Glacial lake outburst floods	44	300,000	N/A
June	South Africa – Eastern Cape floods	103	5,000	288 million
June-September	Europe – Summer heatwave	24,400	–	N/A
July	Texas, USA – Flash floods	135	N/A	N/A
July–October	South Asia – Monsoon floods	1,900	500,000	510 million
July	China – Northern China floods	70	80,000	N/A
July–August	South Korea – Record rainfall and flooding	23	14,500	N/A
August	Spain and Portugal – Iberian Peninsula wildfires	8	N/A	N/A
September–October	Vietnam – Three typhoons in three weeks	85	N/A	1.73 billion
October	Mexico – Eastern coast flooding	76	7,500	N/A
October	Caribbean – Hurricane Melissa	75	760,000	50 billion
November	Philippines – Back-to-back typhoons	302	1.5 million	N/A
November	Indonesia – Rare equatorial cyclone causes flooding	1,000	570,000	3 billion
November	Thailand and Malaysia – Once-in-300-years rainfall	266	3.6 million	N/A
November	Horn of Africa – Drought returns	N/A	45,000	N/A
November–December	Sri Lanka – Cyclone Ditwah	640	175,000	4 billion
December	USA / Canada – Pacific Northwest river floods	–	100,000	N/A

Climate Change and Emerging Hazards

Event-specific studies found that climate change increased the likelihood and intensity of many 2025 disasters. Cyclone Ditwah produced rainfall 28–160 per cent heavier than would have occurred in a pre-industrial climate. Hurricane Melissa had wind speeds around 7 per cent stronger and rainfall about 16 per cent heavier. European heatwaves were 2–4 °C hotter and up to 70 times more likely in parts of the UK. Fire weather in the Iberian Peninsula was around 40 times more likely and 30 per cent more intense.

Several 2025 disasters involved hazards occurring in places or forms not previously considered likely. In the Hindu Kush Himalaya, six glacial lake outburst floods occurred within four months, an unprecedented frequency. The most damaging floods came from newly formed lakes that were too small to be included in existing monitoring systems, exposing gaps in current hazard detection.

Tropical cyclone behaviour also differed from past experience. Cyclone Senyar became only the second recorded cyclone in the Strait of Malacca, while Cyclone Ditwah formed unusually close to the equator and remained strong over Sri Lanka longer than expected.

Preparedness and Adaptation

Disaster impacts in 2025 varied depending on preparedness, land use, infrastructure design and response capacity. Several high-loss events exposed vulnerabilities where systems were designed for historical conditions. Cyclone-related flooding during Cyclone Ditwah in Sri Lanka and Cyclone Senyar in northern Sumatra caused severe impacts in areas affected by unregulated development, degraded catchments and limited flood preparedness. During the January Los Angeles wildfires, urban water systems were unable to sustain firefighting demand during simultaneous neighbourhood-scale fires, contributing to exceptionally high losses. In Zambia and Zimbabwe, depleted storage at Lake Kariba continued to constrain hydropower generation throughout 2025, despite improved rainfall, illustrating the slow recovery of energy systems following multi-year drought.

By contrast, several events showed that preparedness reduced loss of life even under extreme conditions. During the Pacific Northwest atmospheric river floods, large-scale evacuations were implemented ahead of peak flooding, and no deaths were reported despite record river levels. In Texas, catastrophic flash flooding resulted in very high fatalities where no local warning system was in place, while a nearby town operating automated flood warning sirens reported no casualties under comparable conditions.

In high-mountain regions, glacial lake outburst floods caused damage in multiple catchments in the Hindu Kush Himalaya, but where lakes were monitored and warning systems existed, evacuations prevented fatalities. The most damaging events originated from newly formed lakes not yet included in monitoring systems, highlighting both the benefits and current limits of adaptation.

Overall, 2025 showed that preparedness and adaptation influenced disaster outcomes in specific and measurable ways. Early warning and evacuation consistently reduced loss of life, while land-use legacies, infrastructure design and funding constraints strongly shaped displacement, damage and recovery.

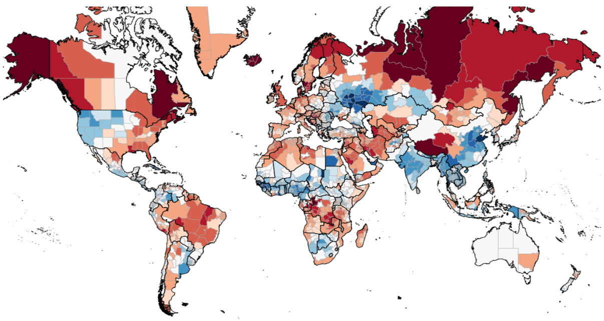
Outlook for 2026

A look at hydrological conditions at the end of 2025 can help assess the risk of droughts developing in 2026. This is less applicable to flood events, as the change from drought to flood conditions can happen rapidly following intense rainfall brought on by storms or cyclones.

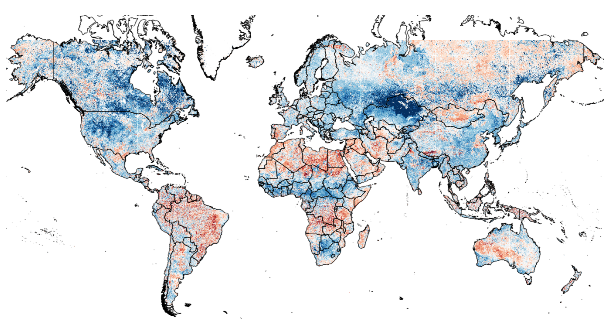
Soil moisture, vegetation condition, lake volume and total terrestrial water storage at the end of 2025 all remain below average in most Mediterranean countries, the Arabian Peninsula, the Horn of Africa, several African countries below the equator, and Brazil in South America as well as parts of Central Asia and Siberia. A subset of the same indicators also points at unusually dry conditions in the British Isles, western Canada, Texas and northern Mexico in North America and parts of Brazil and Argentina in South America. This indicates the potential for drought to develop in 2026 in those regions.

As of December 2025, La Niña conditions are forecast to continue in early 2026 with a transition to neutral conditions most likely in January-March 2026 (68% chance)[118]. La Niña conditions typically enhance rainfall in some regions while suppressing it in others, influencing both drought and flood risk patterns globally.

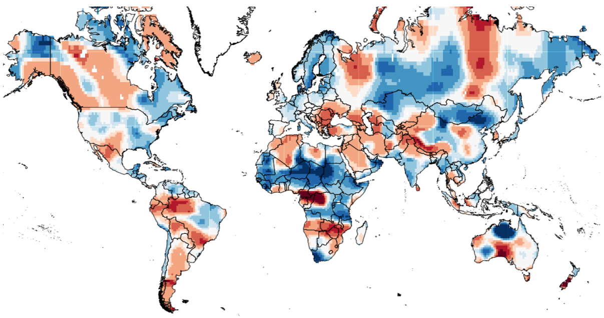
***Standardised anomalies** for October-December average values of selected variables (see p. 63 for legend).*



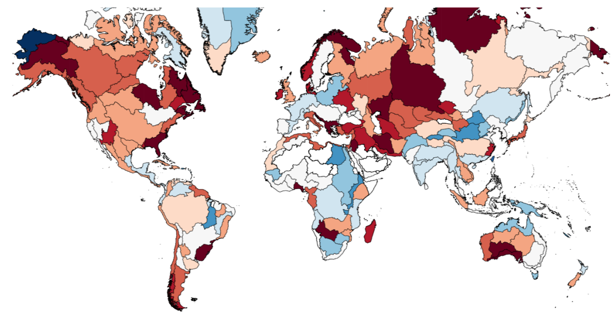
Soil moisture, by administrative region



Vegetation condition, by administrative region



Total terrestrial water storage



Combined lake volume, by river basin

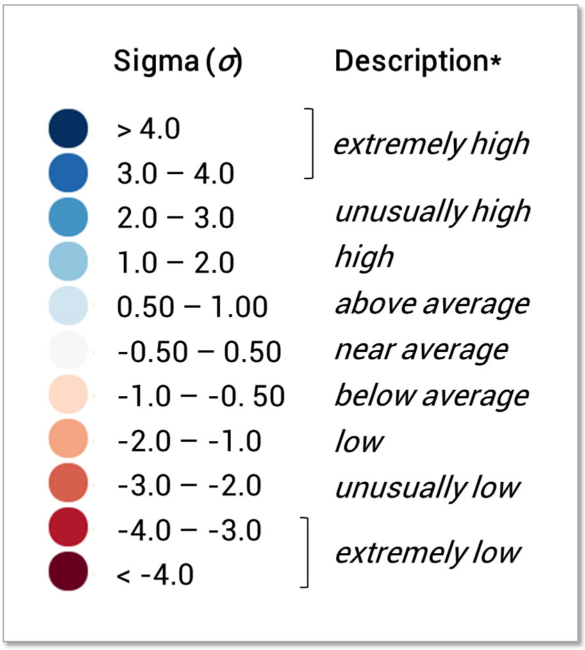
[118] NOAA / National Weather Service, 11 December 2025 (link)

Regions unlikely to develop drought conditions for at least several months include the Sahel region, South Africa and Botswana in Africa, Northern Australia, western USA and eastern Canada in North America, and most of Asia, except the Western and Central Asia, Mongolia and eastern Siberia. In these wetter regions, the greater risk may be for flooding, landslides and other challenges related to excessive wetness if high rainfall events occur.

Due to ongoing climate change, global temperatures are likely to increase further in 2026, leading to more heatwaves, greater bushfire risk, intense storms, and extreme rainfall events. This includes a greater likelihood of fast developing 'flash floods' and 'flash droughts' for all regions.

Colour legend and interpretation of standard anomalies.

(colours are reversed for air temperature to be more intuitive)



About the Global Water Monitor

The Global Water Monitor is an international research initiative that tracks changes across the global water cycle using satellite observations, ground-based data, and hydrological models. It aims to make information on water availability, extremes, and variability more timely, transparent, and accessible for public interest and decision-making.

This **2025 Summary Report** provides a curated synthesis of observed global conditions, extreme events, and emerging risks. It complements the Global Water Monitor online platform, which offers interactive access to detailed current and historical climate and water data.

The Global Water Monitor is developed and maintained by an international consortium of research institutions and organisations.

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