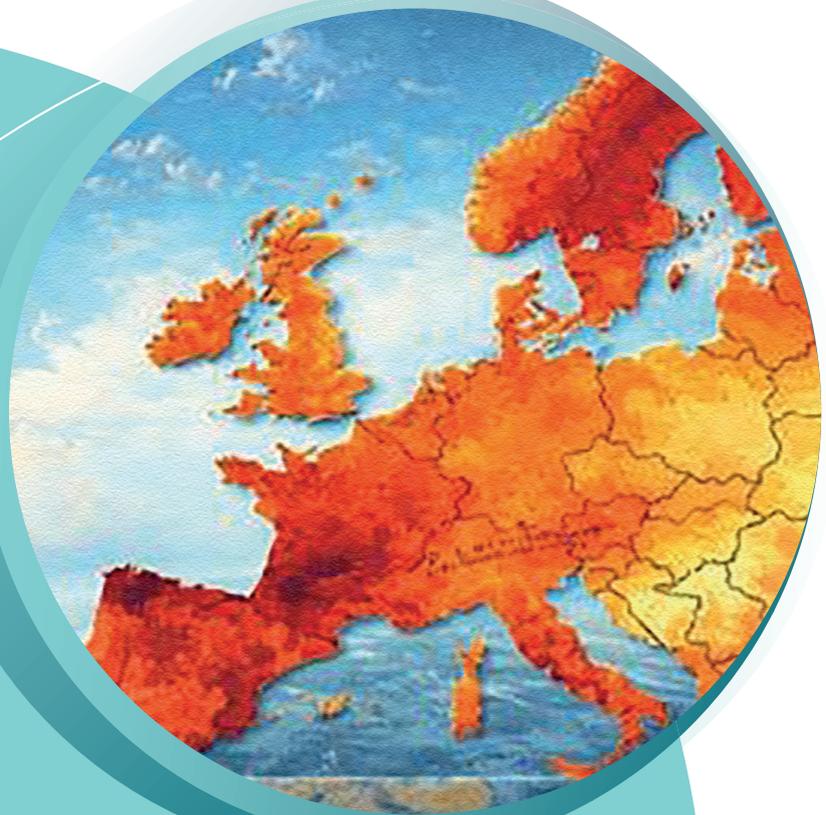


EVAPORATIVE COOLING PERFORMING IN CLIMATE CHANGE

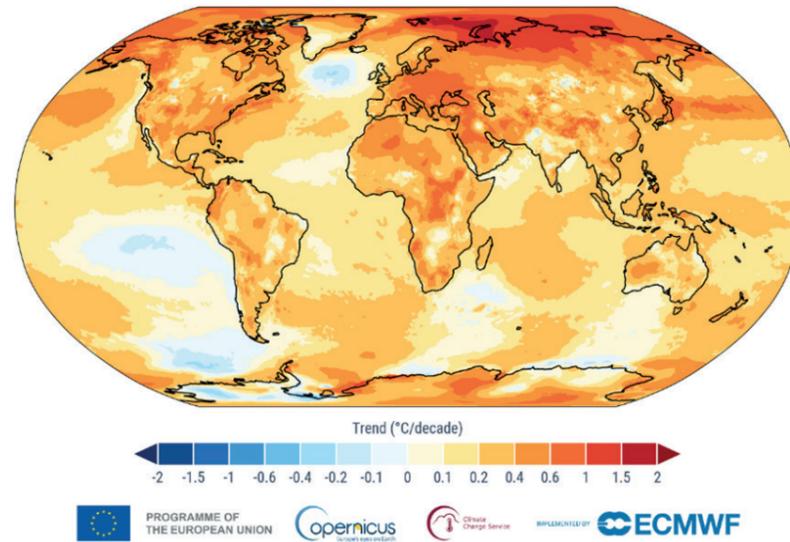


WARMEST YEAR ON RECORD

Globally, 2024 was the warmest year on record and the first with an average temperature exceeding 1.5°C above the pre-industrial level. The last ten years have been the warmest ten years on record. Europe is the fastest-warming of all the WMO regions, at around twice the global average.

Linear trend in annual surface air temperature for 1995–2024

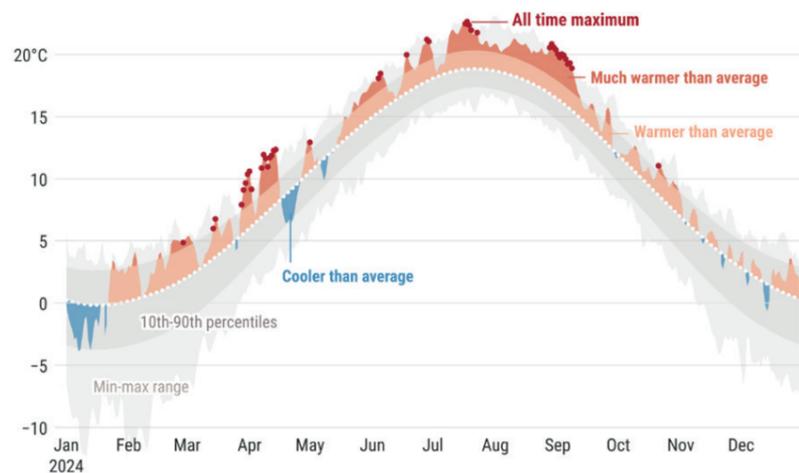
Data: ERA5 • Credit: C3S/ECMWF



In the year 2024, around 45% of days saw well-above-average temperatures, and around 12% of days were the warmest on record.

Average daily surface air temperature for Europe

Data: E-OBS • Credit: KNMI/C3S/ECMWF



Temperatures over European land. The light grey area shows the range between the all-time minimum and maximum while the darker grey area shows the 10th and 90th percentiles over 1991–2020. The average (dotted white line) is represented by the median for 1991–2020.

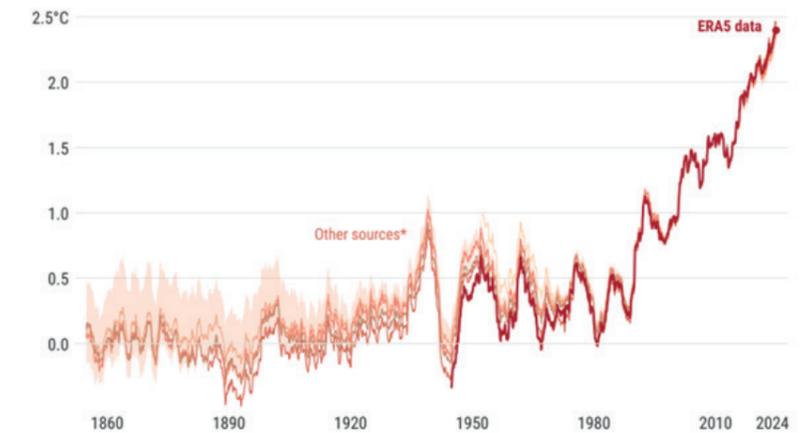
DRY BULB TEMPERATURE VS WET BULB TEMPERATURE

Europe has warmed faster than any other continent in recent decades. The average rate of temperature increase over Europe, according to ERA5, is $0.53 \pm 0.16^\circ\text{C}$ per decade from 1995 to 2024.

Using observations and reanalysis datasets, a remarkable warming of summer WBT during the period 1958–2021 over Europe has been demonstrated. Specifically, the European summer WBT has increased by over 1.0°C in the past 64 years.¹ The annual trend is 0.22°C per decade.

European surface temperature: increase above pre-industrial

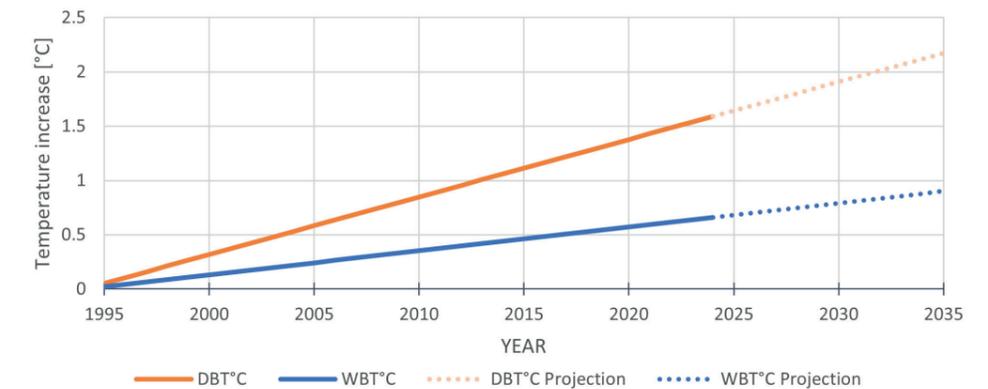
Reference period: pre-industrial (1850–1900)
• Credit: C3S/ECMWF
• 5-year average



*Other sources comprise JRA-3Q, GISTEMPv4, NOAA GlobalTempv6, Berkeley Earth and the HadCRUT5 ensemble mean. Shading shows the range of the HadCRUT5 ensemble.

WHAT DOES IT MEAN FOR EVAPORATIVE COOLING?

Dry Bulb vs Wet Bulb Temperature trends in Europe (1995–2024)



The positive consequences of the stability of the wet bulb temperatures:

- There is no need to over-design the cooling towers (and associated cooling chain like exchangers and chillers) because of global warming. Keep a fair investment.
- There is a long lasting performance of the cooling tower, with certitude that the requested cold water temperature will remain as long as the maintenance is done properly.
- Added value is given to building owners as the building utilities performance remain under control.



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