

June Report 2025: The Climate Reality of Western and Central Europe; A Modeled Future That Is Already Present Today

For over two years now, we have been witnessing a fascinating phenomenon: while scientists, politicians, and the media engage in endless debates about whether we have:

already crossed the +1.5 °C threshold set by the Paris Agreement?

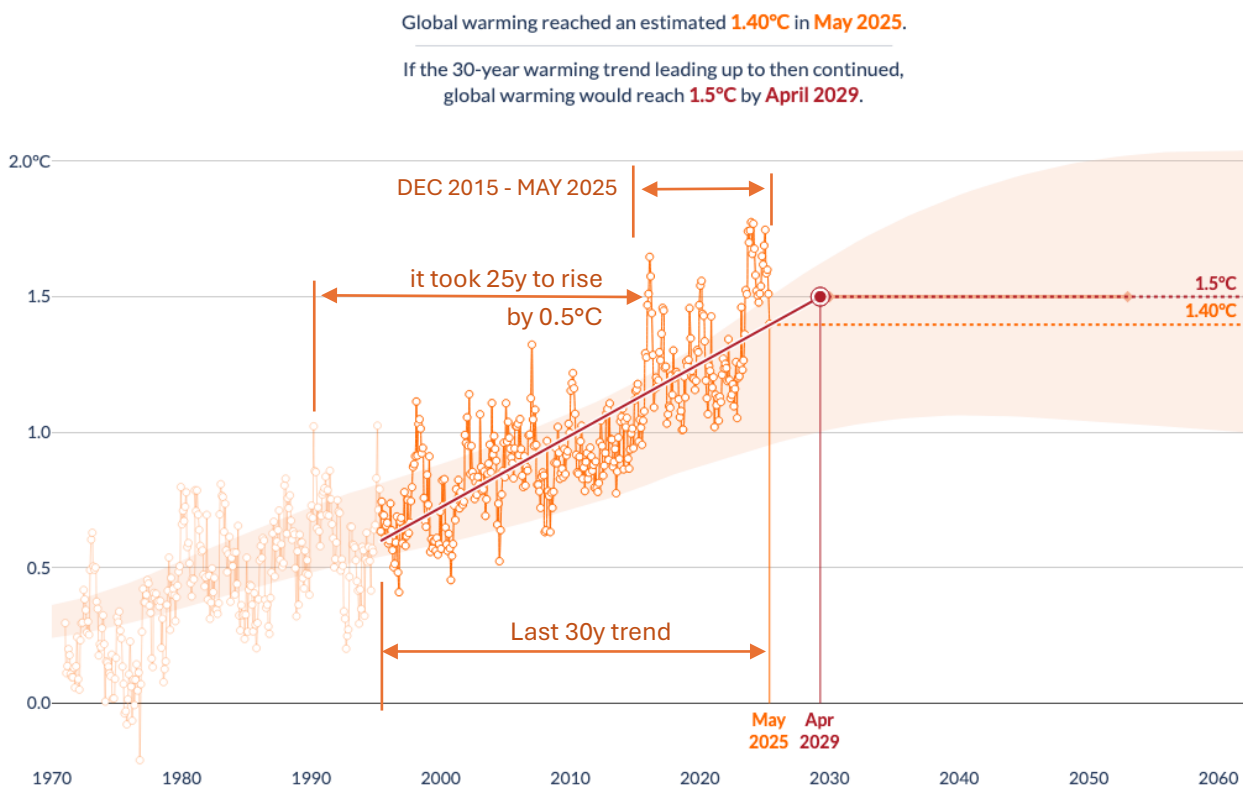
... the climate itself has clearly lost patience waiting for the outcome of our discussions.

And when we finally agree that we have indeed crossed it, we enter a new level of absurd debate: was it “long enough” to take seriously? And if so, what exactly does “long enough” mean? Do we count a five-year average, a 30-year average, or some new “rolling” trend that no one has yet invented but would certainly be useful for further delay?

This debate might have some meaning, if it still concerned reality. Because while we endlessly recalculate decimal points, the climate has meanwhile progressed far more significantly and rapidly than would be comfortable to acknowledge. And certainly not in the direction that the Paris Agreement anticipated. Goals and agreements only make sense if, at the time of their adoption, they are not just nice political gestures but clearly formulated and achievable measures. Because if we plan like politicians aiming only for one election term, rather than as professionals, we might soon spend more time watching who won the hockey championships or which influencer embarrassed themselves the most on TikTok, because climate change will no longer be something we need to solve. It will solve us.

Chart No.1 extracted from Copernicus C3S global temperature trend monitor. ERA5 monthly averaged data on single levels from 1940 to present. This provides 2m temperature data from 1971 onwards, ensuring that the first 30-year linear trend can be calculated for the year 2000 (since January 1971 is 30 years before December 2000).

I have taken the liberty of annotating it with my own notes:



PROGRAMME OF
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The chart shows that we have, in fact, already crossed the +1.5 °C threshold. Since July 2023, we have regularly exceeded it, with only two exceptions, July 2024 and May 2025. However, for an objective assessment, it is necessary to observe the trend over at least a decade. If the current pace continues over the next 30 years, the critical Paris Agreement threshold would be definitively crossed by April 2029, long before politicians decide whether it even warrants attention. What happens globally is one thing, regional realities are often dramatically different, which we will explore later. To properly understand these figures, let us first look at a series of events that may have significantly influenced this trend.

Note: Whenever you encounter a graph showing the increase in global temperature relative to the pre-industrial period, always verify the baseline year from which this value is calculated. Different models use different starting years, which can result in discrepancies of up to 0.2°C. Despite the various calculation standards and visualization methods, simplified interpretations frequently appear on social media, often overlooking the complexity of the data. The worst offenders are visualizations created by skilled artists on platforms like Visual capitalist. The creators of these visually appealing graphics often have little understanding of what they are actually depicting. Such visualizations should be avoided entirely when assessing the situation.

So, what exactly have we crossed? A number on paper, a cycle, or a tipping point?

Another popular line of climate relativization claims that nothing serious is happening. Allegedly, we are just experiencing a strong El Niño phase, which occurs regularly. About every eight years, the world heats up somewhat, then it passes, and everything returns to “normal”.

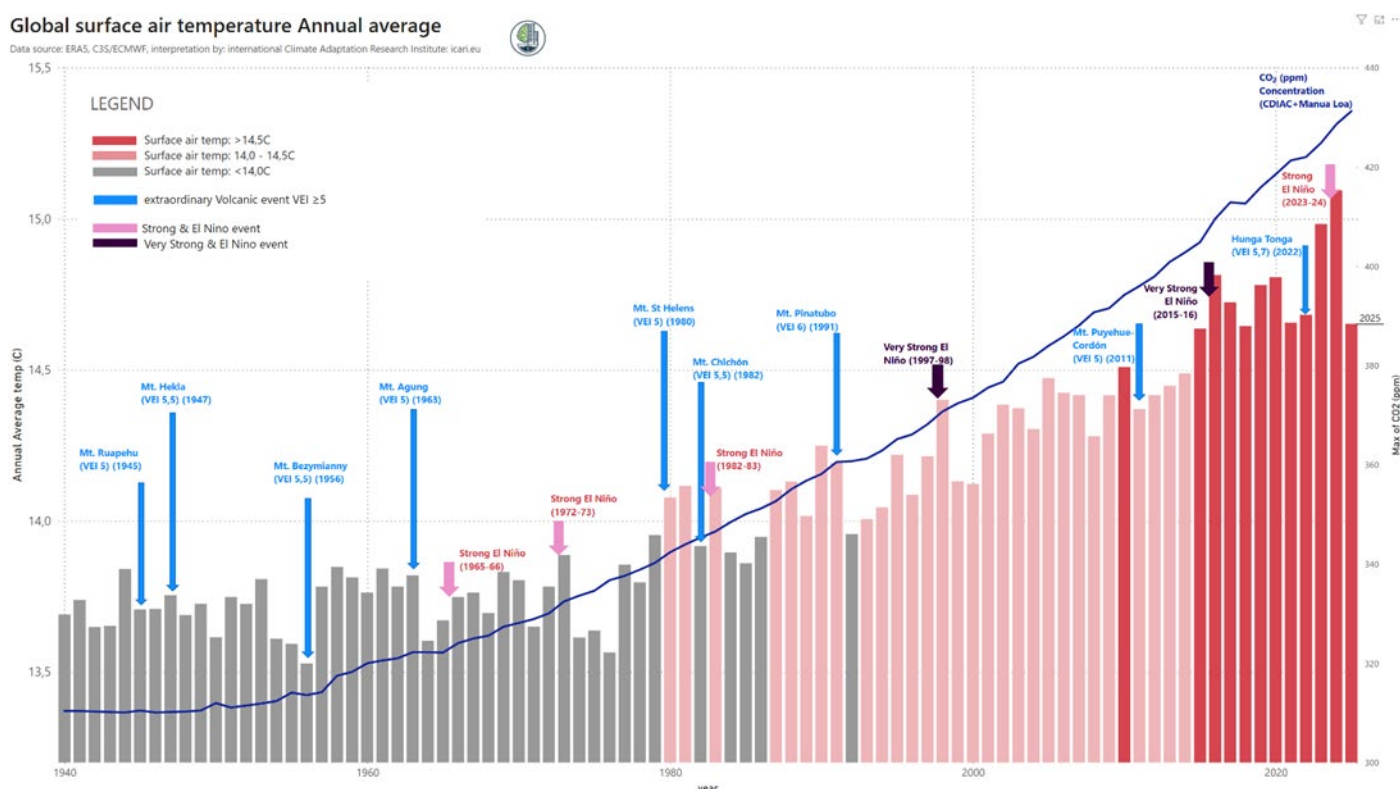


Chart No.2 however, shows that this notion increasingly conflicts with the data.

To seriously understand what is happening, we need more than just one data point. That is why we have assembled this multidisciplinary overview for the years 1940 to 2025, which includes:

A. Bar chart = Annual average surface (2m) temperature in °C, left Y-axis, dataset source Copernicus ERA5/C3S

Gray bars represent temperatures below 14.0 °C

Pink bars represent temperatures between 14.0 and 14.5 °C

Red bars represent temperatures above 14.5 °C

B. Dark blue line graph = CO₂ concentration in ppm, right Y-axis, dataset sources: CDIAC for modeled historical data before 1958 and Mauna Loa from 1958 onward

C. Blue vertical arrows = Volcanic Explosivity Index (VEI) ≥ 5 , dataset source: Smithsonian Institution, Global Volcanism Program. The description includes the volcano's name, VEI, and year of eruption

D. Pink vertical arrows = Strong El Niño events according to ENSO classification, dataset source: NCEI/NOAA

How to read all this:

Yes, strong El Niño events are accompanied by a temporary rise in global temperatures. However, in recent decades, this rise has not returned to previous levels but has instead become a new baseline for further warming.

Volcanic eruptions with VEI ≥ 5 , which used to cool the Earth by several tenths of a degree, have become less significant against the backdrop of ongoing warming. Not because the volcanoes have weakened, but because warming is becoming stronger.

So, what does the chart tell us?

- El Niño helps to suddenly "jump" to new records, but it does not explain the overall trend.
- Volcanic eruptions can slow the rise, but on their own cannot reverse the long-term trend. That would require extremely frequent and intense eruptions.
- The most important curve in the chart is not the bars but the blue CO₂ line, as it dictates where the whole show is heading.

From 1958 to 2024, CO₂ levels rose from approximately 315 ppm to over 420 ppm, closely tracking the increase in average global temperature without the need for more complicated explanations.

Chart No. 3: Natural Warming Factor in Focus: El Niño



Scientists monitor the El Niño oscillation because it significantly influences global climate patterns, including precipitation, temperatures, and extreme events such as droughts and floods. This oscillation causes short-term but pronounced changes in ocean temperatures, which can either amplify or temporarily slow down global warming. Understanding El Niño is therefore crucial for more accurate climate modeling and weather forecasting worldwide.

This chart shows two different oceanic indices that indicate the strength and intensity of the El Niño phenomenon in the Pacific region:

The Oceanic Niño Index (ONI) (top chart) is the official and standard measure calculated as a 3-month running average of sea surface temperature (SST) anomalies in the Niño 3.4 region (5°N–5°S, 170°–120°W). This index defines a “Strong El Niño” as a period during which the ONI exceeds +1.5 °C for at least five consecutive 3-month periods, and a “Very Strong El Niño” when it exceeds +2 °C for the same duration.

The Relative Oceanic Niño Index (RONI) (bottom chart) is a newer index that, besides SST anomalies, incorporates additional climate parameters and provides a more specific assessment of El Niño event intensity. RONI uses a modified methodology and, in some cases, is more conservative in evaluating extreme events.

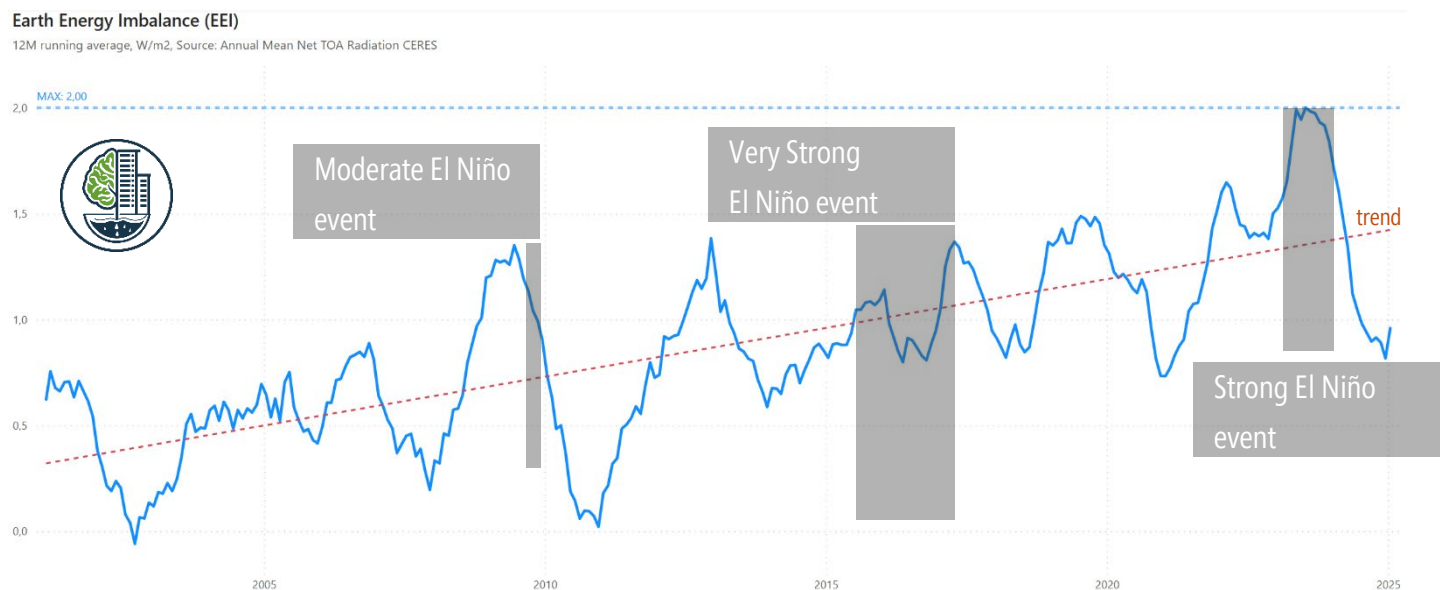
Comparing two El Niño events:

In 2015/2016, ONI registered a “Very Strong El Niño”, with five consecutive 3-month averages of SST anomalies exceeding +2 °C (dark bars). Additionally, the remaining three months also exceeded the “Strong El Niño” threshold (+1.5 °C).

In 2023/2024, ONI identified only a “Strong El Niño”, with five consecutive averages exceeding +1.5 °C but not reaching +2 °C (pink bars). In contrast, RONI does not classify this event even as a “Strong El Niño,” highlighting methodological and sensitivity differences between the two indices.

Despite the milder El Niño rating in 2023/2024, this period recorded the highest temperatures in history. This underscores that El Niño as a natural phenomenon is not the sole factor influencing global warming. For a comprehensive understanding of temperature changes, it is essential to consider other climatic processes, including human activities and atmospheric changes.

Chart No. 4: Natural Warming Factor – The Sun Is Calm; It’s Us Who Are Heating Up



The chart depicts the Earth Energy Imbalance (EEI), representing the difference between the Earth's incoming and outgoing energy measured in W/m², smoothed using a 12-month moving average. The data originates from NASA CERES, specifically the Energy Balanced and Filled (EBAF) Climate Data Record dataset, which includes monthly and climatological averages of observed Top of Atmosphere (TOA) and modeled surface radiation fluxes, accounting for cloud effects (Cloud Radiative Effect, CRE).

The graph reveals an increasing trend in EEI, indicating that the Earth is absorbing more energy than it radiates back into space—a key driver of global warming. Analysis of the relationship between ENSO events and EEI shows that a direct correlation is not always present—some strong El Niño events occur during periods of low or declining EEI values, suggesting that ENSO is not the sole factor influencing the Earth's energy balance. The long-term increase in EEI thus requires consideration of additional natural and, above all, anthropogenic factors that collectively shape the dynamics of global warming.

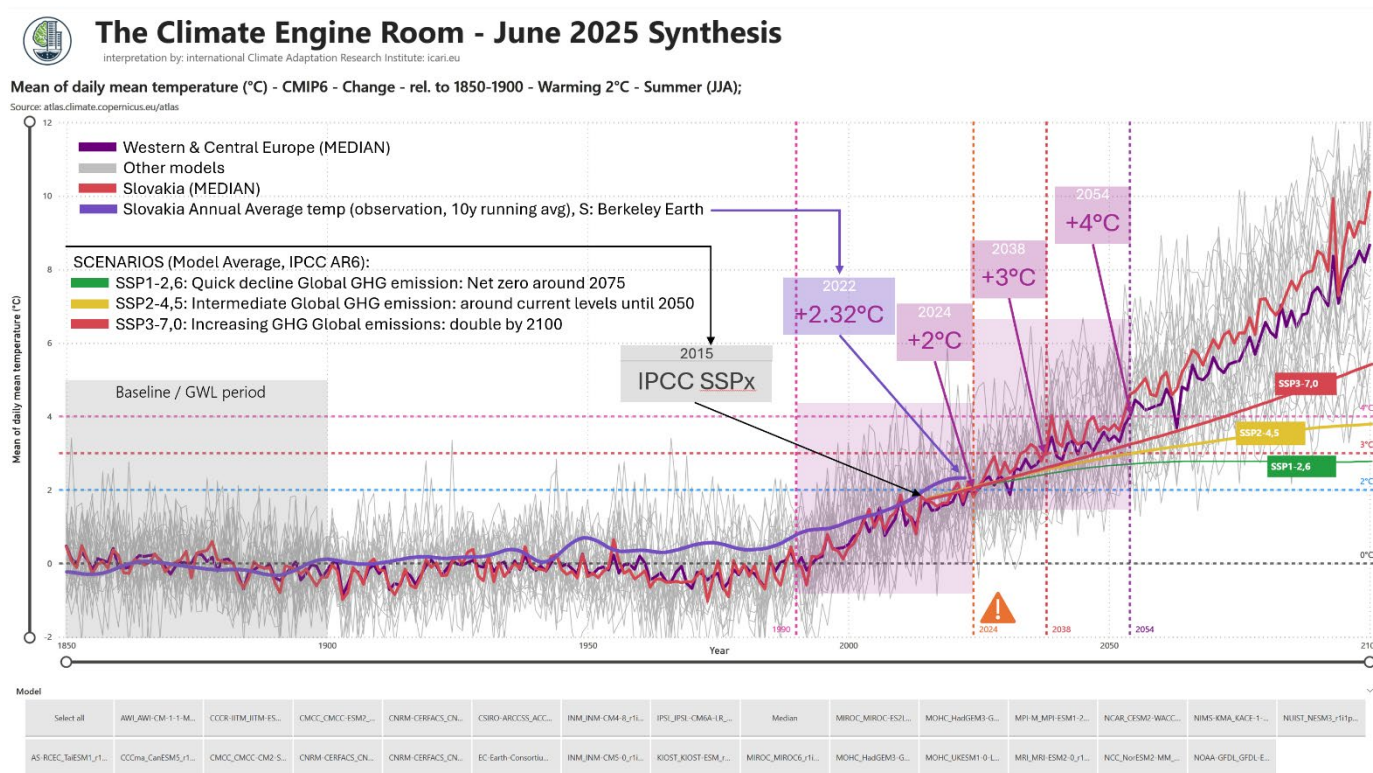
This is why this chart offers a far more meaningful understanding of the climate future for our part of Europe than the previous Chart No. 1 (Global warming 1.5 °C). **Instead of abstract and often hard-to-imagine global averages, it shows what is really happening, or will happen, in our immediate surroundings.** Looking at these figures, it becomes much harder to argue that “nothing serious is going on”. If anyone is still unconcerned about global warming, perhaps regional overheating will finally catch their attention.

Figure 1 is a line graph showing the mean of daily mean temperature (°C) from 1850 to 2100. The graph compares three scenarios: Western & Central Europe (MEDIAN) in purple, Other models in grey, and Slovakia (MEDIAN) in red. A shaded grey area from 1850 to 1950 represents the 'Baseline / GWL period'. Vertical dashed lines mark the years 1950, 2024, 2038, and 2054. Shaded purple boxes indicate projected temperature increases: +2°C by 2024, +3°C by 2038, and +4°C by 2054. Horizontal dashed lines are drawn at 0°C, 2°C, 3°C, and 4°C. The graph shows a clear upward trend in temperature projections for all scenarios, with the Western & Central Europe (MEDIAN) scenario showing the most significant increase.

Model	AWI_AWI-CM-1-1-M...	CCCR-ITIM_ITIM-ES...	CMCC_CMCC-ESM2_...	CNRM-CERFACS_CN...	CSIRO-ARCCSS_ACC...	INM_INM-CM4-8_r1L...	IPSL_IPSL-CM6A-LR...	Median	MIROC_MIROC-ES2L...	MOHC_HadGEM3-G...	MPI-MP-ESM1-2...	NCAR_CESM2-WACC...	NIMS-KMA_KACE-1...	NUST_NESM3_11tp...
AS-RCEC_TaESM1_r1...	CCOma_CanESM5_r1...	CMCC_CMCC-CM2-S...	CNRM-CERFACS_CN...	CNRM-CERFACS_CN...	EC-Earth-Consorti...	INM_INM-CM5-0_r1L...	KIOST_KIOST-ESM...	MIROC_MIROC_r1L...	MOHC_HadGEM3-G...	MOHC_UKESM1-0-L...	MRI_MRI-ESM2-0_r1...	NCC_NorESM2-MM...	NOAA-GFDL_GFDL-E...	

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Chart No. 7: The Future That Has Already Happened – Slovakia Outpaces the Models (A Negative Signal)



Here comes a turning point: observed annual temperatures in Slovakia already reached +2.32 °C above pre-industrial levels in 2022 (source: Berkeley Earth, 10-year moving average). In other words, what climate models predicted as a future scenario for global warming of +2 °C is already happening in Slovakia, not as a simulation, but as measurable reality.

If we are already seeing an annual average of +2.32 °C, then the summer months, which warm faster, are likely closer to the scenario of +2.5 to +3 °C global warming. Slovakia is therefore living the future we only intended to model. Even more concerning is that the current temperature trend (light purple line) already surpassed all three IPCC (AR6) SSP scenario trajectories in 2022:

SSP1-2.6 (green): sharp decline in global emissions, reaching carbon neutrality around 2075.

SSP2-4.5 (yellow): stabilization of global emissions roughly at current levels until 2050.

SSP3-7.0 (red): global emissions continue to rise and are expected to double by 2100.

Slovakia is warming faster than even the most pessimistic global scenario anticipated. This is not just a “bad signal” – it is proof that adaptation must be based on the realities of specific regions rather than global averages. There is no single “magic pill” that fits Germany, Slovakia, and Bangladesh equally.

This temporal shift is a warning: if we want to plan climate adaptation seriously, it is not enough to wait for the global curve to catch up. In many regions, we have already surpassed it. And if Slovakia has already outpaced it today, then the question is not how to model the future, but how to manage the present.

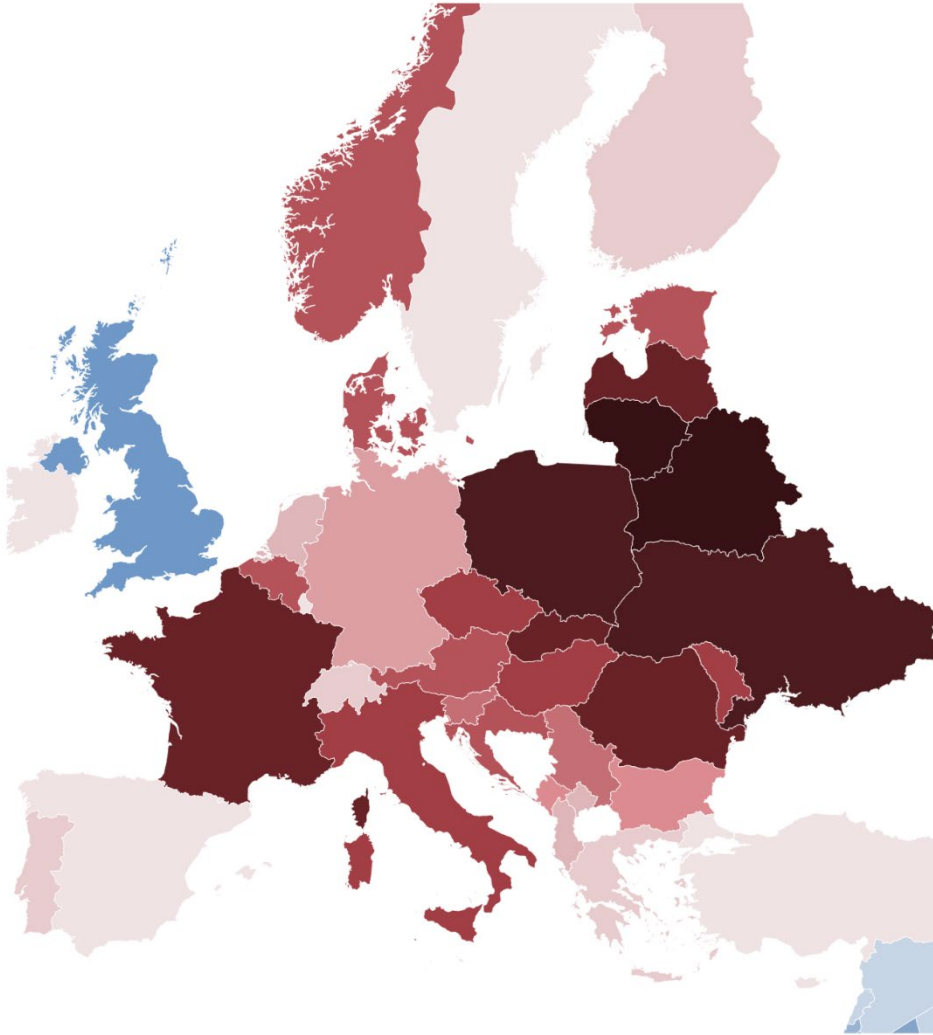
To better understand that Slovakia is not an exception but part of a broader continental trend, we will now examine warming across European countries, not through a graph this time, but through a map, because spatial reality often speaks louder than average numbers

Chart No. 8: The Year 2024 Reveals Uneven Warming Across Europe

Uneven Regional Climate Warming Acceleration (2024, Europe)

Warming that countries experienced in 2024 relative their 1951–1980 averages. Source: Berkeley Earth Surface Temperature data mo...

Warming increase (°C) ● 1,3 ● 1,6 ● 1,7 ● 1,8 ● 1,9 ● 2 ● 2,1 ● 2,2 ● 2,3 ● 2,4 ● 2,6 ● 2,7 ● 2,8 ● 2,9 ● 3 ● 3,1 ● 3,2 ● 3,3 ▶



The latest data from Berkeley Earth (2024) show that **surface warming in Europe is neither fair nor uniform**. This map displays the average annual increase in surface temperature by country compared to the reference period of 1951–1980.

Slovakia and its northeastern neighbors are **already experiencing increases of +3.0 °C to +3.4 °C, which are the highest values on the continent**. For reference, the CMIP6 median projected warming was around +2 °C. In contrast, Western Europe, except for France, is faring much better. The winning ticket for slow warming goes to the UK.

This asymmetry is due to several climatological factors:

Reduced influence of the Atlantic Ocean (surprisingly, Slovakia is landlocked),

Less regular precipitation cycles,

Lower soil moisture (meaning less energy is consumed in evaporation, making more available to raise temperatures),

And increasingly frequent summer blocking high-pressure systems that cause prolonged dry periods and extreme heat.

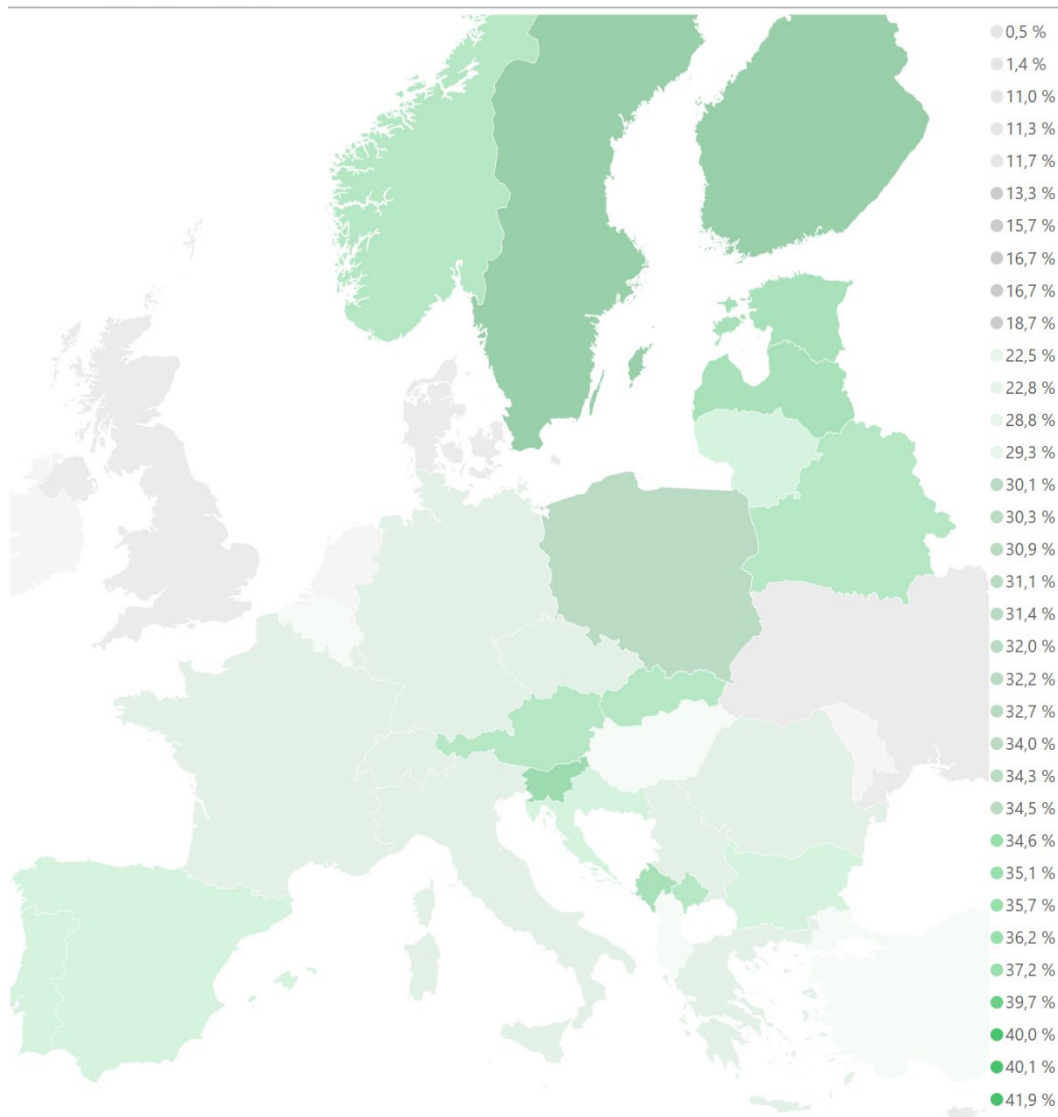
While Western Europe may still enjoy the illusion of “moderate” warming in some places, Eastern and Central Europe have already entered a phase better described as regional climate destabilization. Adaptation cannot be based on a European average because such an average does not exist. Instead of one magic number applied uniformly to all countries, we need realistic and geographically differentiated targets. Otherwise, we will end up with plans that look good in PowerPoint but in practice feel like a poorly tailored suit, made to measure, but not ours.

It would not hurt if EU policymakers finally took notice. Building climate plans based on a single universal parameter for all countries is not only nonsensical but counterproductive. Each state needs its own thoughtfully set target values, otherwise, we risk producing another nicely formatted, yet completely detached strategic document that serves only as filler between two Brussels conferences.

Chart No. 9: More Forests ≠ Less Warming: The Forest Paradox in the Climate Context

Forest area as a proportion of land area (2020, Europe)

Source: FAOSTAT dataset . Units: %



Based on FAOSTAT data by country (2020), one might expect that countries with a high proportion of forest cover would be less prone to warming due to increased evapotranspiration and CO₂ sequestration. However,

Slovakia (40% forest cover) ranks among the more forested countries in Europe, alongside Estonia, Latvia, and Belarus (all over 40% forest cover).

Despite this, in 2024 these countries were among the fastest warming regions in Europe, with temperature increases exceeding +3 °C compared to the 1951–1980 baseline.

Why this paradox? Several possible explanations:

- Forests protect the microclimate, not the macroclimate. Forests mitigate warming in their immediate surroundings but do not compensate for global climate trends.
- Changes in precipitation and cloud patterns. Forests can also dry out, when rainfall decreases and cloud cover dissipates, evaporation drops, and soil drought reduces the cooling effect of vegetation.
- Forest type and vegetation health matter. Degraded or drought-stressed forests evaporate less water, reducing the cooling effect.
- Topography and inland location. Mountainous terrain in the heart of Europe is cut off from oceanic moisture, even dense forests here face higher heat stress.

Forests are an important component of microclimatic protection but cannot stop regional warming on their own. Having forests does not mean the battle is won. On the contrary, it means we must invest more in their health, structure, adaptive management, and especially in a system of measures that acknowledges that even cooling has its limits.

Planting trees is indeed important, but it must be done strategically and in an organized manner, not haphazardly. Forests also have a critical characteristic: their low albedo means they absorb more heat, which relates directly to Earth's Energy Imbalance (EEI). Healthy and thriving forests can cool their surroundings by emitting more moisture through transpiration, a process linked to photosynthesis. However, photosynthesis efficiency declines at higher temperatures, reducing this cooling effect. Therefore, forests alone will not save us. What will save us is thoughtful stewardship of forest health and development.

Chart No. 10: A Break in the Carbon Balance: When Nature Could No Longer Keep Up with Anthropogenic Emissions

The infographic shows the historical development of CO₂ emissions and their share of total greenhouse gases, alongside the sharp rise in atmospheric CO₂ concentration, especially after 1984, when we surpassed 50% of all emissions since 1850. A key finding is that more than half of the climate burden we experience today has arisen in the last 40 years, not two centuries ago. After World War II, a turning point occurred when the massive consumption of fossil fuels overwhelmed the biosphere's capacity to sequester carbon.

The most important line elements of the chart are:

- The solid blue line shows the share of CO₂ in total greenhouse gas emissions (%) on the left axis (sources: JRC/EDGAR v9)
- The solid red line shows the share of CO₂ in total emissions (%) on the left axis (sources: The Global Carbon Project GCB2024v18, PRIMAP-hist)
- The dotted orange line shows the decadal percentage change in CO₂ concentration on the right axis (sources: CDIAC + Mauna Loa).

Notice the two pie charts at the bottom right:

The larger one shows the share of countries (or country groups) in GHG emissions during 1984–2023 (representing 50% of all anthropogenic emissions since 1850). The BRICS countries have dominated for over 40 years with a 38% share. The USA follows with 14%, and the EU27 with 10%. The rest of the world accounts for 38%.

The smaller pie chart shows the distribution of these shares in 2023. The data come from the JRC/EDGAR v9 dataset (September 2024).

Despite these facts, many people lacking data literacy spread their own, often false, conclusions. Instead of more marketing concepts like “Net Zero,” we need a realistic and achievable plan created by experts, not politicians.

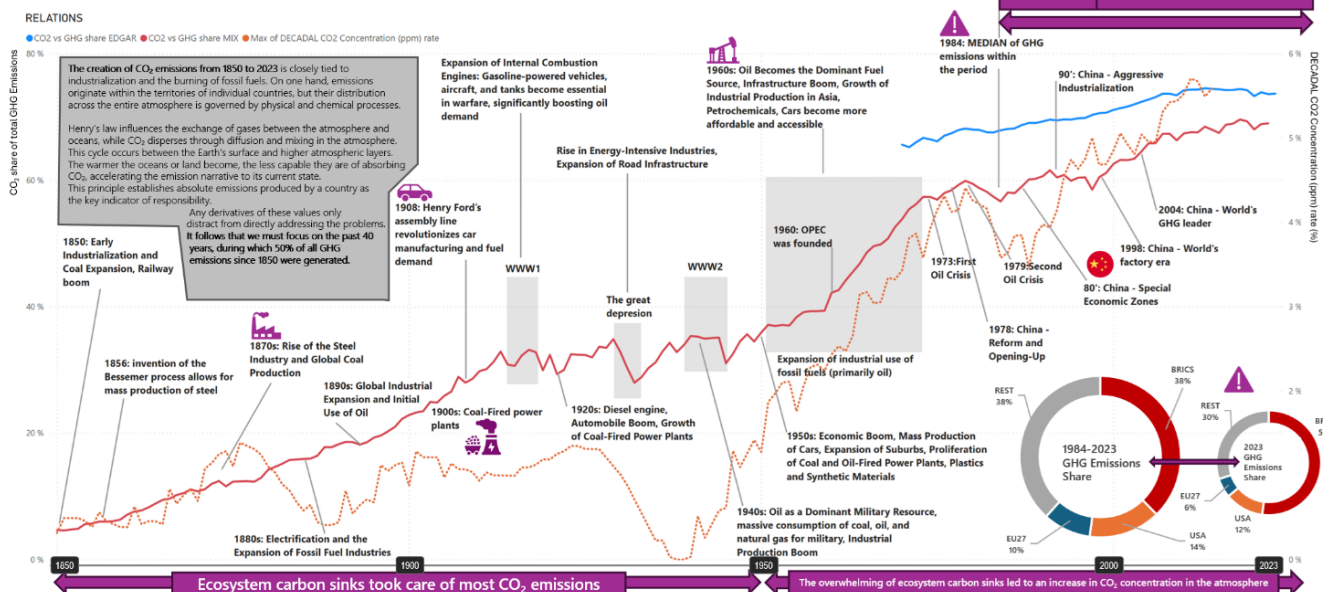
Things must be called what they truly are. It is time to set aside nonsensical Marxist-utopian accusations and stop treating IPCC and COP events merely as opportunities for selfies with celebrities. These platforms should be places for serious dialogue and real solutions, not political posturing and empty gestures.

CO₂ share (%) of Total GHG = Fossil fuels combustion impact DECADAL CO₂ Concentration (ppm) rate (%)

international Climate
Adaptation Research
Institute
ICARI.eu



Sources: JRC/EDGAR (The Emissions Database for Global Atmospheric Research) DB v9/2024, The Global Carbon Project GCB2024v18, PRIMAP-hist, CDIAC



Adaptation Is Not a Distant Goal, but an Immediate Necessity

While global diplomacy continues to debate how to avoid +1.5 °C warming, much of Eastern and Central Europe, including Slovakia, is already living in a +3 °C reality. This report confirms that climate models were too cautious; real observations show we are further along than previously thought. This does not yet account for the impact of reduced sulfate aerosols, which humanity has “removed” from the atmosphere, details of which I discuss in a related LinkedIn article.

Urgent adaptation must be a priority, as emphasized in the report by the European Scientific Advisory Board on Climate Change (ESABCC, May 2025): [more info]. Infrastructure, energy, and economic planning must respond to current conditions, not hypothetical future scenarios or outdated assumptions. Existing models require a significant upgrade to capture the dynamics of regional climate change.

Our institute may not have the long history of the oldest academic centers, but we are already working on major climate adaptation projects in urban areas. Without understanding the causes of change, it is impossible to develop solutions that withstand today's and tomorrow's challenges. The problem across the EU27 is that projects have been, and continue to be, funded without alignment to this reality. We risk wasting time and valuable resources that could otherwise drive real progress.

A Message for Everyone:

Grant evaluators in current calls (including Horizon), planners of the EU27's next programming period, policymakers, media, self-styled influencers, research colleagues, the public, everyone, it's time to treat climate adaptation as more than just paper plans or social media trends. Let us stop producing and supporting mountains of meaningless information that distract us from what truly matters.

Those who assess grant proposals and approve climate budgets must rely on relevant, verified data rather than superficial Instagram posts. Unfortunately, this superficiality is common across the EU, significantly reducing the effectiveness and impact of these measures.

Climate change does not care whether you are “green” or not. It is not a fashion trend, political tool, or opportunity for self-promotion. Climate change proceeds regardless of who holds the megaphone, what opinions are voiced, or what banner one carries. It does not care whether someone loudly claims it or ignores it. It is an unrelenting physical process with consequences that affect us all, without exception.

Therefore, it is not only pointless but harmful when green topics are exploited to maintain status within certain groups or as political tools without genuine efforts toward solutions. Climate adaptation demands honesty, facts, and courage to face harsh realities, not green marketing and empty gestures. If we want real change, we must stop playing theater and start acting with responsibility, expertise, and respect for what science proves and what the planet requires.

Successful climate adaptation requires coordinated interdisciplinary work, supported by precise regional data and strong educational foundations for evaluators and policymakers. Only then can we ensure budgets are allocated effectively and measures truly build resilience to today's and future climate challenges.

Climate goals must be achievable. Otherwise, they are just wishful thinking or promises for a single election term or merely attempts to gain social media reach at any cost.

I would like to thank Leon Simons for his insightful suggestions. His challenges have been a motivating force in refining the details of this complex topic.

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REFERENCE:

- Copernicus Climate Change Service (C3S). (n.d.). *Global Temperature Trend Monitor*. Retrieved July 2025, from <https://apps.climate.copernicus.eu/global-temperature-trend-monitor/?tab=plot>
- Copernicus Climate Change Service (C3S). (2024). *European State of the Climate 2024 – Graphics Gallery*. Retrieved July 2025, from <https://climate.copernicus.eu/esotc/2024/graphics-gallery>
- Copernicus Climate Change Service (C3S). (n.d.). *Climate Data Store – Climate Atlas*. Retrieved July 2025, from <https://atlas.climate.copernicus.eu/atlas>
- Food and Agriculture Organization of the United Nations (FAO). (n.d.). *Forest area as a proportion of total land area*. FAOSTAT. Retrieved July 2025, from <https://www.fao.org/faostat/en/#search/15.1.1%20Forest%20area%20as%20a%20proportion%20of%20total%20land%20area>
- Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M., Schaaf, E., Monforti-Ferrario, F., Becker, W., Quadrelli, R., Riskez Martin, A., Taghavi-Moharamli, P., Köykkä, J., Grassi, G., Rossi, S., Melo, J., Oom, D., Branco, A., San-Miguel, J., Manca, G., Pisoni, E., Vignati, E., & Pekar, F. (2024). *GHG emissions of all world countries*. Publications Office of the European Union. <https://doi.org/10.2760/4002897>
- European Commission, Joint Research Centre (JRC). Retrieved July 2025, from https://edgar.jrc.ec.europa.eu/report_2024
- Berkeley Earth. (2024). *Global Temperature Report for 2024*. Retrieved July 2025, from <https://berkeleyearth.org/global-temperature-report-for-2024/>
- Carbon Dioxide Information Analysis Center (CDIAC), *Mauna Loa CO₂ monthly data, Atmospheric Trace Gases Project* (doi:10.3334/CDIAC/ATG.011).
Available at: <https://data.ess-dive.lbl.gov/view/doi%3A10.3334%2FCDIAC%2FATG.011>
Note: We used data from the dataset only up to and including the year 1957.
- NOAA Global Monitoring Laboratory, Trends in Atmospheric Carbon Dioxide.
Available at: <https://gml.noaa.gov/ccgg/trends/data.html>
- NOAA Climate Prediction Center (CPC). (n.d.). Climate Indices. Retrieved July 2, 2025, from <https://www.cpc.ncep.noaa.gov/data/indices/>
- NOAA Physical Sciences Laboratory (PSL). (n.d.). ENSO Dashboard. Retrieved July 2, 2025, from <https://psl.noaa.gov/enso/dashboard.html>
- PRIMAP-hist Team. (2023). *The PRIMAP-hist national historical emissions time series (1750–2023) v2.6.1* [Data set]. Zenodo. <https://zenodo.org/records/15016289>