Climate overshoot:

The way back below 1.5°C

November 2026



CLIMATE ANALYTICS

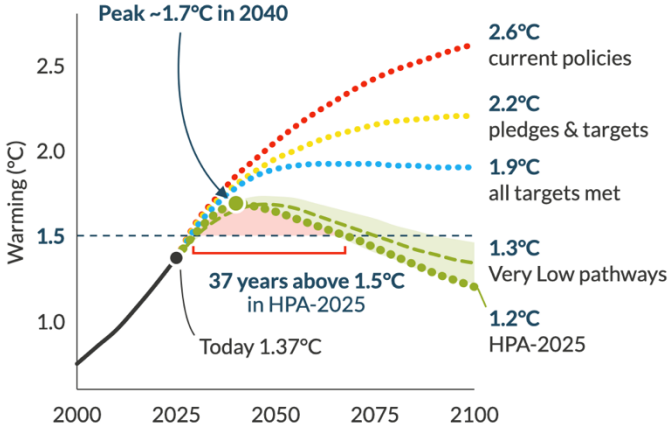
Overshooting the Paris Agreement's 1.5°C limit is now unavoidable. How high warming peaks, how long it stays above 1.5°C and how soon it falls back below will determine the damage. An earlier, lower peak and a fast decline below 1.5°C will limit – but not eliminate – lasting harm, giving a chance to adapt and to escape dangerous tipping points. Achieving this will require a rapid transition away from fossil fuels. Solutions already exist and are cost-effective.

Overshoot is now unavoidable – its height and duration are still up to us

Human-induced warming reached 1.37°C in 2025. After a decade of insufficient action, it is unavoidable that long-term warming will exceed 1.5°C around 2030 even under the most ambitious pathways. In its 2025 advisory opinion, the International Court of Justice confirmed 1.5°C as the primary temperature goal of the Paris Agreement. There is a strong legal argument that imminent or actual exceedance of 1.5°C increases the obligation on all countries to act now with the highest possible ambition to bring warming back below this level as soon as possible.

Current policies are leading us to at least 2.6°C by 2100, and even an optimistic interpretation of full delivery of all pledges and net zero targets leads to 1.9°C – a permanent overshoot. National targets under the Paris Agreement must be a floor, not a ceiling, meaning that every target raised and every pledge delivered early brings the peak down.

Warming can still return below 1.5°C by 2100



Source: Climate Action Tracker (November 2025); Climate Analytics.

Under our highest possible ambition pathway (HPA-2025), warming peaks at around 1.7°C around 2040, returns below 1.5°C after about 37 years and falls to about 1.2°C by 2100. The 11 Very Low emissions pathways from ScenarioMIP for the next generation of climate models (CMIP7) confirm this picture: on average, they also peak at around 1.7°C and bring warming back to about 1.3°C by 2100, after around 40 years above 1.5°C. Together with HPA-2025, they form what we call the HPA family.

Getting there requires cutting emissions far faster than today: in the HPA-2025, by a little under 20% by 2030 and by 49% by 2035, relative to 2025. These cuts, including deep cuts in methane, largely decide how high warming peaks. Reaching net zero CO_2 by mid-century or before stops warming. Reaching net zero greenhouse gas emissions by the 2070s or before brings temperatures back down.

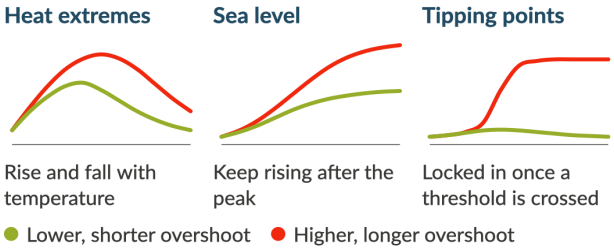
Every tenth of a degree matters

Read together, Articles 2.1 and 4.1 of the Paris Agreement and the decisions that followed up to COP30 provide the legal basis on which countries must act: a low peak, a short overshoot and warming back below 1.5°C by 2100.

The science is clear on why, both on the way up and on the way down. A higher and longer overshoot brings risk thresholds forward: impacts reach dangerous levels sooner, and more of them materialise. It also pushes societies and ecosystems towards the limits of adaptation. Hard limits have already been reached in some ecosystems, the effectiveness of some ecosystem-based measures declines with warming, and the adaptive capacity of human systems also erodes during overshoot, leaving lasting socioeconomic losses, especially among the most vulnerable.

Some impacts follow the peak, others keep building for as long as warming stays high, and some do not reverse at all. A lower and shorter overshoot reduces all three types of impact – and for some, it is the difference between recovery and permanent loss.

A lower, shorter overshoot means less damage

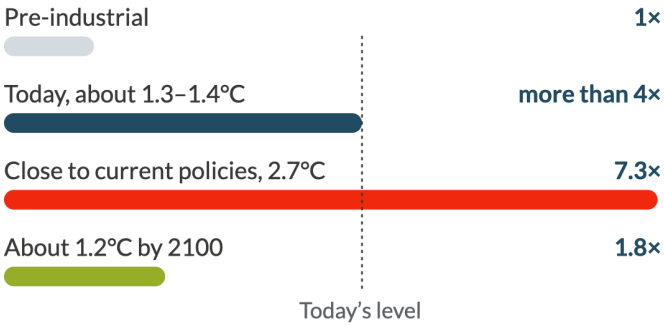


Schematic, no units.

Heat follows the peak

At today's warming of about 1.3–1.4°C, record-breaking daily temperatures over land are already more than four times as frequent as in pre-industrial times. A higher peak adds directly to the toll: warming of 1.7°C rather than 1.5°C by 2050 could increase the number of people exposed to heatwaves by around a third in a number of countries. Falling temperatures reverse this. With warming at about 1.2°C by 2100, record-breaking heat would become less frequent than it is today. Speed matters too: slowing warming quickly reduces the frequency of these records.

Falling temperatures bring heat records back below today's level



Frequency of record-breaking daily maximum temperatures over land, compared with pre-industrial. Source: Fischer et al. (2025).

Sea-level rise and glacier loss keep building

The rate of sea-level rise has more than doubled since satellite measurements began, from 2.1 mm a year in 1992 to 4.5 mm in 2024. This is driven significantly by ice melt, which is affected by each increment of overshoot. Mountain glaciers lose around 2% of their mass for each additional 0.1°C of warming in the long term and may only have a chance of recovering once warming falls towards 1°C, a level that is also important for ice sheet stability. A pathway that peaks at around 1.5–1.6°C and returns to about 1.2°C by 2100 would reduce sea-level rise this century by about 18 cm compared with current policies. Sea-level rise continues for centuries after temperatures fall, so what is committed during the overshoot cannot be reversed on any humanly relevant timescale.

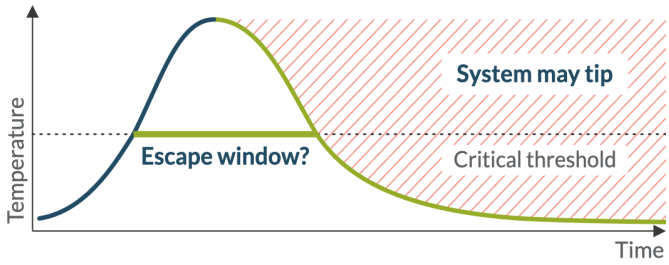
The ocean keeps paying

Marine heatwave days have more than tripled since 1991; limiting warming to around 2°C instead of 2.6°C could cut the share of the ocean in near-permanent heatwave conditions from roughly half to around a third by 2100, with further reductions closer to 1.5°C. Past emissions have already committed the ocean to more than three times the oxygen loss seen so far, and oxygen keeps declining to at least 2300, even after temperatures fall. In one modelling study, stabilising at 1.2°C rather than 1.5°C would cut long-term habitat loss due to deoxygenation for exploited marine species by around 40%. The planetary boundary for ocean acidification has already been crossed, and recovery depends on lowering CO_2 concentrations – which in turn depends on cutting CO_2 emissions from fossil fuels and deforestation and, in the longer run, on carbon dioxide removal.

A low peak and short overshoot may rescue systems from tipping

Tipping risk increases with every additional 0.1°C of overshoot, and it is also clear that the duration of overshoot increases the risk of tipping. Crossing a threshold does not mean tipping immediately. Tipping sometimes takes time to unfold, so a temporary exceedance may be survived if the duration of overshoot is short and warming falls fast enough. This potentially creates an escape window: the lower temperatures peak, the faster they fall after the peak and the lower they end up, the better the chance of avoiding dangerous tipping of key systems.

The faster and further warming falls, the better the chance of rescue



Warming falls fast enough: system can be rescued

Coral reefs may already have reached their tipping point, estimated at 1–1.5°C. In October 2026, the IUCN Red List of Ecosystems found 96% of assessed shallow-water reef ecosystems critically endangered under projected warming. Peaking warming soon, and then bringing warming below 1.5°C as soon as possible, while reducing other pressures such as pollution, has the best chance of creating a window for the long-term survival of coral reefs across their present range.

The West Antarctic ice sheet could have a collapse threshold close to 1.5°C, leading to several metres of sea-level rise over a few centuries. Bringing warming below 1.5°C by the end of the century would help prevent the polar ice sheets from tipping, even if some have already reached their tipping thresholds.

The Amazon faces warming and deforestation together. A recent review places its safe boundaries at 1.5°C and 10% deforestation, and deforestation has already passed that level. Rescuing it means returning warming below 1.5°C as soon as possible and halting deforestation. In the year to July 2026, the deforestation rate fell by 41.8%, the biggest drop since records began in 1988, showing what ambitious policy can do.

The Atlantic Meridional Overturning Circulation (AMOC) is weakening, and its collapse would be a very high-consequence event, bringing extreme cold to northern Europe and weakening the West African and South Asian monsoons, threatening agriculture and food security in these regions. Recent evidence suggests AMOC collapse could be triggered at warming levels of around 2°C or below under current emissions rates – with the risk beginning above 1.5°C – meaning the window to prevent it may be narrow. Because the risk depends on the rate of warming as well as its level, limiting the rate of emissions is critical: leading-edge research shows this could reduce the risk of tipping.

No country is safe

The impacts of overshoot are felt everywhere, but not equally. Those who did least to cause the crisis are hit first and hardest, and for Small Island Developing States (SIDS) and the Least Developed Countries (LDCs), overshoot threatens lives, livelihoods and, in some cases, their very existence.

SIDS AND LDCs: OVERSHOOT IS AN EXISTENTIAL THREAT

SIDS already lose between 1% and 9% of GDP each year to disasters. Rising seas and stronger waves could leave several atoll islands uninhabitable. Many islands in the Pacific and Indian Oceans sit in sea-level rise hotspots, where the contribution from melting ice exceeds the global average by up to about a quarter. Pacific economies that rely on fisheries also face shrinking catches as stocks shift away from their waters.

In **LDCs**, disasters hit economies around ten times harder than in the richest countries, as a share of GDP, and 69% of deaths from climate-related disasters over the past 50 years occurred there. In Nepal and across the Himalaya, thawing permafrost is destabilising slopes with disastrous consequences and glaciers keep shrinking, even at 1.5°C. In West Africa, sea-level rise adds to the threat along a coast where 64% of areas are highly or very highly vulnerable to flooding and erosion.

Overshoot, even if temporary, intensifies climate impacts and raises the risk of irreversible economic and non-economic losses and damages. Physical changes may reverse as temperatures fall, but losses in communities with low adaptive capacity may not. They extend beyond GDP to forced displacement and the loss of identity, culture and sense of place, and they fall most heavily on the most vulnerable.

But no country is safe: along with SIDS and LDCs, major emitters are already counting the costs of a warming world, and cutting emissions fast is in their own interest.

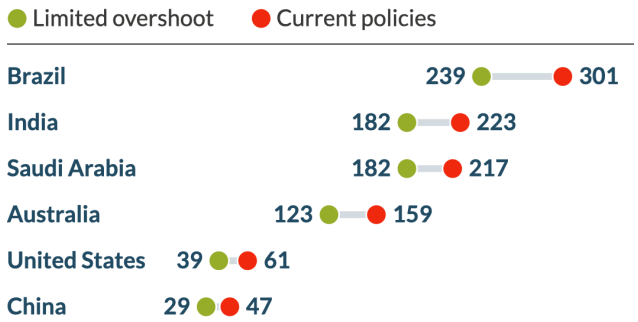
Impacts already felt

HIT FIRST AND HARDEST		
	~+90%	**Small island states** disaster damage as share of GDP, 2011–22
	8% of GDP	**Least developed countries** labour productivity lost to heat
MAJOR EMITTERS		
	6–9×	**China** heat-induced productivity loss, 2001–2019
	~50%	**United States** Helene, Milton damage due to climate
	50,391	**Europe** 2026 heat deaths, ~2/3 due to climate
	30×+	**India** 2022 heatwave likelihood due to climate
	+55%	**Brazil** coffee prices, after the 2023 drought
	1300+	**Saudi Arabia** deaths at the 2024 Hajj, above 50°C
	−31%	**Australia** southern Great Barrier Reef coral, 2024–25

Impacts linked to climate change and climate-related extremes. The strength of attribution varies by study.

In the **United States**, 23 major weather and climate disasters cost USD 115 billion in 2025, the third-highest number on record. Extreme weather in summer 2025 is estimated to have cost the **EU** nearly EUR 43 billion, with weather-related losses projected to rise to EUR 126 billion by 2029. In **China**, heat is already cutting productivity, especially in construction and manufacturing. The **Middle East** is warming at twice the global average rate. In **Brazil**, where only 13% of agricultural land is irrigated, agribusiness is highly exposed to drought. In **Australia**, even a temporary overshoot could lock in the collapse of much of the Great Barrier Reef. Every major emitter has a direct stake in keeping overshoot as small and short as possible.

Limiting overshoot spares every major emitter days of high heat risk



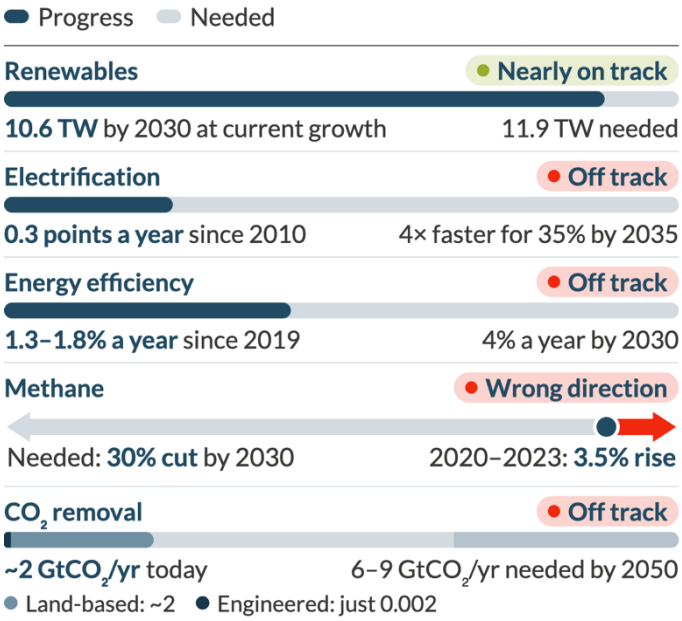
Days with high heat risk by 2100, under a pathway that limits overshoot and gets below 1.5°C by 2100 and under current policies. Source: Climate Impact Explorer.

The solutions exist, the pace does not yet

Fossil fuels account for around 70% of global greenhouse gas emissions, so phasing them out is at the heart of the

solution. In the HPA-2025, coal is phased out in the 2040s, gas in the 2050s and oil in the 2060s. Fossil fuel use halves by 2035, with coal, gas and oil demand falling around 70%, 50% and 30% respectively.

Renewables are close to being on track, other levers lag or are off track



Source: IRENA; IEA; Enerdata; Climate Analytics (2026); State of CDR (2026).

Power, road transport and buildings account for about two-thirds of fossil fuel demand, and mature alternatives exist in all three: solar and wind power, electric vehicles and heat pumps, backed by efficiency improvements. Renewables, energy efficiency and electrification work together, but progress and targets differ. Solar capacity has doubled every three years for more than a decade, and renewable capacity grew by 15.5% in 2025. If that pace holds, it will reach 10.6 TW by 2030, close to the tripling goal agreed at COP28. Efficiency is well off track, at around 1.3–1.8% a year since 2019 against the COP28 goal of 4% per year over 2022-2030. The COP31 presidency has proposed a global goal of 35% electrification by 2035, requiring around four times the rate of progress seen since 2010. Methane emissions are still rising despite pledges to reduce them, and cutting them is another key lever for limiting the peak.

The renewable transition is already paying off. Fossil fuels cause more than 5 million air pollution deaths a year, and avoided air pollution damages from switching to renewable power are already worth around USD 21.5 billion in the United States and USD 6 billion in Germany. Finance must keep pace. Emerging markets and developing economies excluding China will need USD 3.2 trillion a year in climate and related development investment by 2035, including USD 1.3 trillion from international sources, while the COP29 goal provides for USD 300 billion a year. SIDS and LDCs are particularly affected by this gap. Delay makes impacts more severe and responses significantly more costly.

SOLAR RADIATION MODIFICATION: A DANGEROUS DISTRACTION

SRM would not reverse climate change but create a different, engineered climate, with unequal risks and a threat of termination shock if stopped. Leaving CO_2 in the atmosphere, it would do nothing for ocean acidification. It would itself constitute dangerous anthropogenic interference with the climate system.

Carbon dioxide removal: essential, but only alongside rapid emission cuts

In a world overshooting 1.5°C, carbon dioxide removal is a necessity, not a choice: pathways that bring warming back below 1.5°C remove around 550 $GtCO_2$ by 2100, reaching around 6–9 $GtCO_2$ a year by 2050. Its purpose is to bring temperatures down from their peak, not to compensate for continued fossil fuel use. Stopping warming depends above all on deep emission cuts, and removals cannot be scaled up enough to do the job alone. They also face permanence, scaleability and sustainability limits: today's removals of about 2 $GtCO_2$ a year come almost entirely from forests and land, where wildfires and other disturbances could release the carbon again and large-scale deployment can conflict with food production and biodiversity. Novel methods with durable storage remove at present just 0.002 $GtCO_2$ a year, are at early stages and need far more investment and research to resolve adverse side effects.

Every year of delay raises the peak

Overshoot is now unavoidable, but how high it goes, how long it lasts and how far temperatures fall are still being decided, above all by choices made in this decade. Limiting the peak means fewer deaths and less lasting damage, and bringing warming below 1.5°C reduces impacts further and offers a potential escape from tipping points.

What needs to happen

- **Close the 2035 gap**: cut emissions 49% from 2025 levels by 2035.
- **Phase out fossil fuels**: set national road maps with timelines for transitioning away from fossil fuels, stop new fossil fuel development and eliminate fossil fuel subsidies.
- **Deliver the key levers**: renewables, efficiency, clean electrification, methane cuts and an end to deforestation.
- **Plan for carbon dioxide removal now**: within sustainability limits, as a complement to emission cuts, never a replacement.
- **Scale up finance** for the most vulnerable, especially SIDS and LDCs.

The task now is to keep overshoot as low and as short as possible, and to bring warming back below 1.5°C by 2100.