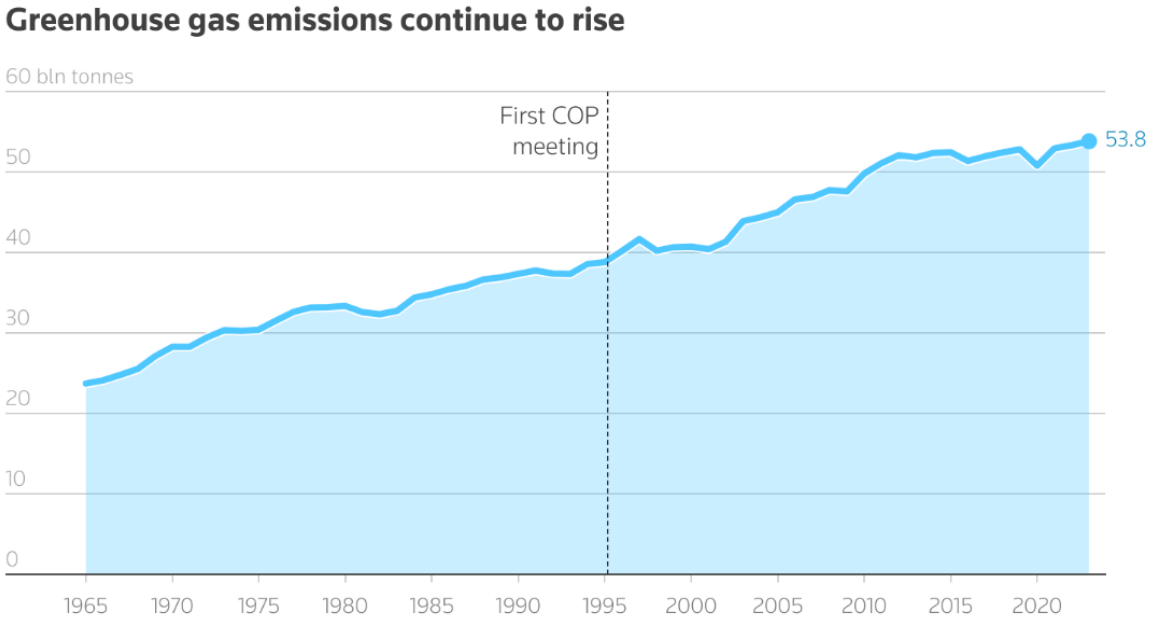
ESR NEWSLETTER
November 2025

Contents

1.Three Sobering Charts

Extracted from Reuters website article headed "Planet in peril: 30 years of climate talks in six charts", November 7, 2025



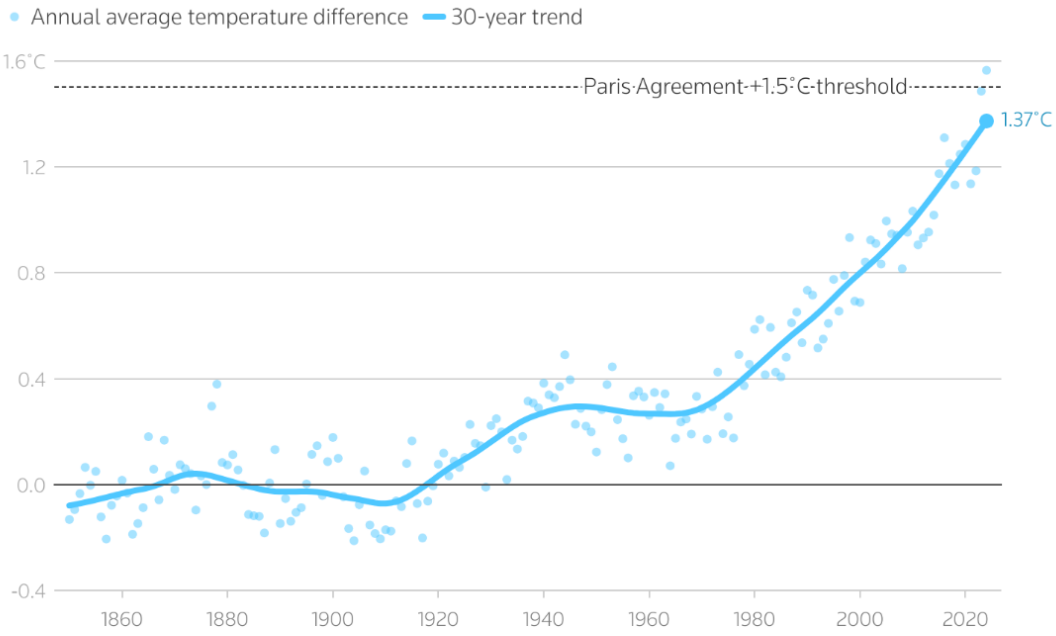
Note: Greenhouse gas emissions include carbon dioxide, methane and nitrous oxide from all sources, measured in tonnes of carbon dioxide-equivalents over a 100-year timescale.

Source: Our World in Data | Tiana McGee

A line chart showing greenhouse gas emissions from 1965 to 2023 shows that they steadily rose over that time period.

Global temperature is getting hotter faster

Temperature difference from the pre-industrial period, 1850-1900



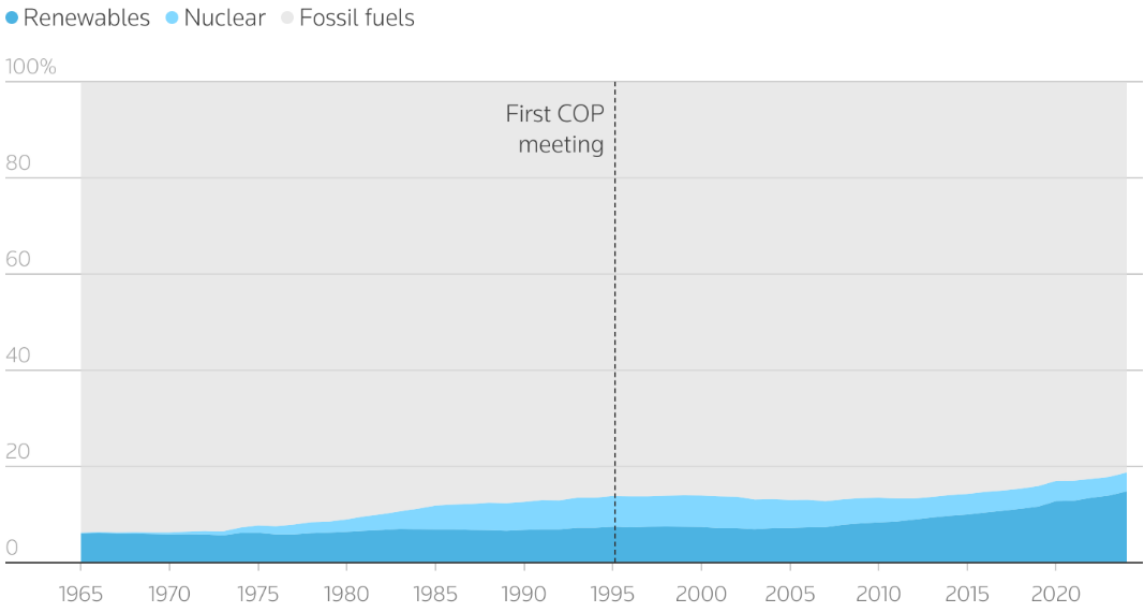
Note: Pre-industrial period is defined as 1850-1900. The 30-year trend uses a Lowess fit, a statistical technique that reveals long-term trends by averaging nearby data points.

Source: Berkeley Earth | Ally J. Levine

Line chart shows annual temperature difference from pre-industrial levels (1850-1990) with a 30-year trend line reaching 1.37°C in 2024. Includes Paris Agreement +1.5°C threshold. Data spans 1860-2024, showing accelerated warming beginning in the 1970s.

Renewable energy grows slowly

Energy sources as share of global energy demand



Note: Energy sources are measured as fossil fuel equivalents. Renewables include hydropower, solar, wind, geothermal, wave and tidal and bioenergy, but exclude traditional biofuels.

Source: Our World in Data

Area chart showing renewables, nuclear and fossil fuels as share of global energy since 1965. Renewables stayed steady at 6-7% until the mid-2000s, reaching 14.8% by 2024. Fossil fuels remain dominant, 81% in 2024. Nuclear peaked in the 1990s.

2. Shanghai's Underwater Data Centre

From a story by Sarah Jones, The Daily Galaxy, 5 November 2025

China is turning to the ocean to tackle one of the biggest challenges in AI infrastructure. The country has begun building underwater data centres, using the sea's naturally cold temperatures to efficiently cool the powerful servers that drive AI's rapid growth.

As artificial intelligence continues to expand, the demand for computing power grows exponentially, placing an increasing strain on traditional data centres. These facilities, essential for storing and processing the massive amounts of data required by AI, use vast amounts of electricity to keep their servers cool. The problem is that these cooling processes consume as much as 40% of a data centre's total energy use, making energy efficiency a critical concern. To address this, China is looking to the ocean as a solution, hoping to use the water's natural cooling properties to reduce the environmental footprint of its data infrastructure.

As stated by *ZME Science*, the initial underwater data centre, located off the coast of Hainan, uses the ocean's frigid temperatures to cool its servers. Cold seawater is pumped through radiators attached to the server racks, absorbing the waste heat generated by the servers. This method cuts down on the energy required for cooling, which is typically the largest energy consumer in a data centre. By leveraging this natural resource, China's submerged data centres require no freshwater or traditional grid power.

Additionally, the Shanghai project incorporates offshore wind energy as a supplementary power source, highlighting the ambition to make these centres as sustainable as possible. Each of the submerged units, or "cabin-pods," weighs around 1,400 tons and is capable of housing 500 servers. These pods are designed to be modular, so if one fails, it can be lifted back to shore and replaced with a functioning one, minimizing the need for repairs on-site.

One of the most significant challenges is maintenance, as underwater systems are difficult, if not impossible, to repair on-site. In case of a malfunction, the strategy is simple: swap the damaged unit for a new one. Most failures in these centres are caused by human error, dust, or humidity, so the sealed pods, surrounded by inert nitrogen, are designed to be much more reliable than land-based systems.

China's $226 million investment in the Shanghai underwater data centre marks only the beginning. The Hainan project, already operational, is set to expand with a network of 100 cabin-pods. The Shanghai centre, with a modest 24-megawatt capacity, is a prototype for future, far larger facilities, potentially reaching 500 megawatts in total.

Microsoft pioneered similar underwater data centre concepts with its Project Natick but halted the project in 2024, citing high logistical costs and operational complexities. In contrast, China's continued investment signals a readiness to take on these challenges head-on. If successful, these underwater centres could revolutionize the data industry by combining cutting-edge technology with a sustainable energy model, potentially setting a global standard in digital infrastructure.

3. To transform Africa's food system, we need to enable access to renewable energy

From an article by Judith Jacobs and Ahmed Sameh, Reuters Ethical Corporation Magazine, 2025, 4 November 2025

High on the agenda of the COP30 climate conference will be reducing emissions from agriculture and food systems, which are responsible for roughly a third of greenhouse gas emissions, consume 70% of the world's freshwater, and are the primary causes of biodiversity loss.

But food systems can't be transformed in isolation from the energy systems that power them. That's because regenerative practices increase demand for irrigation, storage and processing, while only renewable energy can make those practices viable without a heavy cost to the planet. The prevailing model of input-heavy, fossil-fuel dependent agriculture has already reached its limits in high-income countries. But the stakes could not be higher in Africa, where a significant increase in food production will be required to feed a population projected to reach 2.5 billion by 2050.

In Eastern Africa, for instance, most smallholders rely on rainfed production. Where irrigation is possible, it is often powered by diesel pumps. Without reliable energy for irrigation, processing or storage, farmers remain acutely vulnerable to erratic rainfall, limited crop diversity, soil degradation, and post-harvest losses.

The challenge, then, is to meet Africa's growing demand for food while staying within planetary boundaries.

Alternative technologies and practices already exist. Solar PV module prices have fallen significantly over the last decade, making solar-powered irrigation under many circumstances more competitive with diesel. Biogas systems convert farm waste into fertiliser and clean energy. Cold storage, drying and many processing systems powered by renewables can extend shelf life and cut food losses. Regenerative farming practices – intercropping, cover crops, agroforestry – are already contributing to restoring soils in parts of Kenya, Uganda and Rwanda, and in the longer term can lead to increased yields.

Taken together, these solutions point to a different model; one in which food systems regenerate rather than deplete, and where renewable energy replaces fossil fuels as the power source of production.

The difficulty, is not availability but adoption. Farmers and starting enterprises face high upfront costs and limited access to credit. Advisory services are not equipped to support integrated approaches that span both agriculture and energy. Policies have long been made in sectoral silos. The result is a proliferation of promising pilots and small businesses that rarely add up to systemic change. However, there is a growing recognition of the need for holistic transformation. This is seen in the number of organisations working together through the Agri-Energy Coalition, a global alliance focused on integrating clean energy and food systems.

Building on this momentum, Dutch development agency SNV and the IKEA Foundation, have established the Power For Food Partnership, with a specific focus of connecting regenerative agriculture with the productive use of renewable energy. The premise is that the two systems are mutually reinforcing. If we are really to move towards action on the ground, rethinking and

operationalising solutions through this nexus can reduce emissions, restore ecosystems, and improve resilience in ways that neither can achieve alone.

With the first programmes launched in Uganda, Ethiopia, Rwanda and Kenya, the partnership is a commitment of 45 million euros for five years, and aims to leverage another 55 million euros in investments towards sustained impact.

It works by identifying user-based (and not technology-driven) entry points where agriculture and energy intersect, and then addressing the barriers to adoption. This includes generating and sharing evidence on which models deliver results, strengthening the local ecosystem by building stronger linkages between farmers, small enterprises and markets, and piloting financial instruments such as pay-as-you-go solar or blended finance to lower costs of entry.

Just as important, it involves embedding agriculture–energy nexus thinking in policy frameworks so that solutions are institutionalised, rather than dependent on donor projects. Lessons are shared to enable replication, and local actors are placed at the centre to ensure approaches remain context-specific and owned.

The ambition is that by 2030, regenerative and renewable practices will no longer be marginal but mainstream, with farmers and agribusinesses adopting these models because they are affordable and profitable. It would mean governments, enterprises and financiers integrating the nexus into strategies and budgets, and crowding in once future-proof pathways to scale are visible. Most of all, it would mean food producers themselves – often women and youth excluded from decision-making – gain the agency and tools to sustain their livelihoods within planetary boundaries.

Ultimately, the ambition is to build a set of connections and relationships that enable change to spread once the right conditions are in place. Farmers, small and medium-sized enterprises, governments, financiers and knowledge institutions each play a part, and when their actions converge and begin to reinforce one another, adoption accelerates.

The partnership also builds on commitments from across Africa under CAADP and the Kampala Declaration, linking climate, biodiversity and development goals with practical delivery.

4. Australia's clean power push hits pivotal energy transition milestone

From an article by Gavin Maguire, Reuters, 6 November 2025

Australian utilities generated more electricity from clean power sources than from fossil fuels for the first time ever last month, marking a major energy transition milestone for one of the world's top coal and gas exporters. Utility-supplied electricity output from clean power sources hit 9.88 terawatt hours (TWh) in October, data from energy think tank Ember shows, which exceeded the 9.82 TWh generated by all fossil fuels.

The energy mix breakthrough is due to a 77% surge in Australia's clean power output from five years ago, as well as a 15% reduction in fossil fuel use over that period.

Generation of coal-fired power - which remains Australia's largest electricity source - also hit record lows last month, helping to slash power sector carbon dioxide emissions so far this year by 13.5 million metric tons compared to a year ago.

Australia's clean generation levels look set to keep climbing over the southern hemisphere summer, which may help cement 2025 as a critical threshold when clean energy output Down Under first surpasses fossil fuels in the utility mix.

CLEAN POWER MOMENTUM GROWS

The main driver of Australia's clean power surge has been a 99% increase in clean power generation capacity between 2019 and 2024, from 32 gigawatts (GW) to 63.5 GW, Ember data shows.

That capacity climb compares to a 65% rise in clean capacity globally over the same period, and has set the stage for rapid growth in Australian clean electricity flows so far this decade.

Despite cuts to both coal and gas-fired output. Australia's total electricity supplies have scaled new highs so far in 2025 thanks to record clean power output. Since 2020, Australian utility-supplied clean electricity generation has grown by an average of around 13% a year, which is more than double the global average over that period. That outsized growth pace has allowed Australia to make up ground on peer nations in terms of the share of clean power in electricity production, as Australia had been a notable energy transition laggard until a decade ago.

In 2015, only 14% of Australia's electricity supplies came from clean sources, which was less than half the global average of 33.5% and also well below the Asia-wide average of 24%.

Australia's utilities have more than doubled the share of electricity generation from clean power sources since 2015. As of the end of 2024, however, Australia's clean share had leapfrogged the Asian average of 34% to register a 35.1% share, and narrowed the gap on the global average of 41%.

SOLAR POWERED, BATTERY BACKED

Massive utility-scale solar farms have been the main source of Australia's clean electricity growth this decade, with solar electricity output expanding by an average annual clip of 21%.

That solar growth pace handily exceeded the 13% annual growth in wind power output, and helped solar emerge as Australia's second-largest electricity source behind coal.

Rapid growth in utility-scale battery energy storage systems (BESS) has helped utilities harness the country's solar output to good effect, as the country ranks third globally in terms of BESS capacity, according to consultancy Rystad Energy.

The solar plus battery combination allows utilities to store surplus solar power output during the sunniest parts of the day, and then dispatch that power when electricity consumption peaks in the early evenings.

COAL CUTS

Australian utilities have amplified the impact of rapid clean generation growth by simultaneously lowering fossil fuel generation. From a roughly 78% share of the utility generation mix in 2019, fossil fuels are on track to account for less than 60% of Australia's utility-supplied electricity for the first time in 2025.

Deep cuts have been made to both coal and gas-fired power production since 2019 to accomplish this, with coal-fired output dropping by 16%, gas-fired output by 36% and total fossil fuel-fired production falling by 19% over that time span.

Coal's share of the utility generation mix - which had solidly held above 70% until 2019 - looks set to fall well below 50% over the coming months as the peak season for solar kicks in. Coal-fired generation so far in 2025 is down 4% from the prior year, and coal's share of the utility generation mix has hit a record low of 44%

The opinions expressed here are those of the author, a columnist for Reuters.

5. EU agrees weakened climate target in final-hour deal for COP30

From an article by Kate Abnett, Inti Landauro and Benoit Van Overstraeten, Reuters website, November 6, 2025

- Summary
- EU ministers back goal to cut emissions by 90% by 2040
- Deal lets countries buy more foreign CO2 credits to meet target
- Agreement also includes delay to EU's new carbon market

The U.N. asked all governments worldwide to submit 2035 climate plans before the COP30 climate summit opens on 6 November.

EU climate ministers agreed a 2040 climate change target in the early hours of Wednesday (5 November) after watering down the goal in last-minute negotiations, as they raced to clinch the deal before the U.N. COP30 summit in Brazil.

After negotiating late into Tuesday night, climate ministers from European Union countries approved in a public vote a compromise to cut emissions 90% by 2040, from 1990 levels, but with flexibilities to weaken this aim.

The weakened target would let countries buy foreign carbon credits to cover up to 5% of the 90% emissions-cutting goal. That would effectively weaken to 85% the emissions cuts required from European industries, and pay foreign countries to cut emissions on Europe's behalf to make up the rest. The EU also agreed to consider the option, in future, to use international carbon credits to meet a further 5% of the 2040 emissions reductions - potentially shaving another 5% off the domestic target.

Additionally, countries agreed a 2035 target to cut emissions in a range of 66.25-72.5%.

In a further effort to win over sceptical countries, the EU also agreed to weaken other politically sensitive climate policies - including by delaying the launch of an upcoming EU carbon market by one year, to 2028.

The EU has prided itself on leading international efforts to curb climate change at past COPs. But the dilution of the target reflects a backlash against Europe's ambitious climate agenda, from industries and some governments sceptical that it can afford the measures alongside defence and industrial priorities. The European Commission had originally proposed a 90% emissions-cutting target, with a maximum 3% share of carbon credits. The target was designed to keep the EU on track between its legally-binding goals to cut net emissions by 55% by 2030, and reach net zero emissions by 2050.

6. How sickly forests are felling Europe's climate ambitions

From an article by Alison Withers Kate Abnett and Simon Johnson, Reuters website, November 2025

- Summary
- EU's 2040 emissions goal includes flexibility for forest CO2 absorption issues
- Forests absorbing less CO2 due to climate change, logging
- Political challenges in reducing logging due to economic impact on forestry industry

Concern about the capacity of Europe's forests, degraded by wildfires and droughts, to absorb CO2 emissions was a key reason European Union governments agreed to water down their new 2040 emissions-cutting goal this week. During negotiations on the 2040 goal in recent months, numerous governments - from Sweden, to Latvia, to France - warned that Europe's forests are absorbing far less CO2 emissions.than hoped, in part because of wildfires and droughts made worse by climate change.

FORESTS FALLING SHORT OF CO2 TARGETS

Scientists have documented how climate change is leading to more heatwaves and droughts that dry out trees, slow their growth and set the stage for worse wildfires and pest infestations.

Wildfires burned more than a million hectares of EU land this year, the highest annual amount on record. The amount of CO2 absorbed by Europe's forests and land-use sector has dropped by nearly a third in the last decade because of climate impacts, but also due to increased logging, the European Environment Agency has said.

In Finland, forests have been emitting more carbon than they have absorbed since 2021, according to the Natural Resources Institute Finland. Sweden's CO2 forestry sink has more than halved over the last 20 years.

Sweden and Finland both backed the EU's 90% emissions-cutting goal and pushed back in final-hour negotiations on other countries' attempts to weaken it further, according to EU diplomats. However, they both warned in September they would miss EU forest emissions targets for 2030 and said they faced "dire" economic consequences if they were forced to harvest less wood to comply.

Forests cover around 70% of Sweden and Finland. Wood products make up around 10% of Sweden's exports and almost a fifth for Finland. Around 140,000 people work in the sector in Sweden.

ACCORD GIVES FLEXIBILITY ON TARGETS

The 2040 climate target, agreed after all-night negotiations between ministers in Brussels and before world leaders met on Thursday at the U.N. COP30 Summit in Brazil, included various options to respond to these worries.

One was the introduction of an emergency brake allowing governments to reduce the 2040 climate target if it becomes clear forests and other land-based activities are off track when it comes to absorbing CO2 emissions, according to the EU deal. Another was allowing countries

to buy foreign carbon credits to cover up to 5% of the 90% emissions-cutting goal, potentially shaving 5% off the overall domestic target.

Industries from car manufacturing to the defence sector have been concerned that they may be on the hook to make up any shortfall if forests and wetlands play a weakened role in mitigating emissions. The final target specified that if natural ecosystems underperform, other industries will not be forced to cut emissions faster to deliver the 2040 goal.

7.Solar Geoengineering

From an article by Damian Carrington. Guardian Environment editor, 5 November 2025

If technology to block the sun was used globally and in a coordinated way for a long period – decades or even centuries – there is strong evidence that it would lower the global temperature, the review from the UK's Royal Society concluded.

The world is failing to halt the climate crisis and the researchers said that in future, a judgment might need to be made between the risks of geoengineering and the those of continued global heating, which is already costing lives and livelihoods. The logistics of a large-scale geoengineering effort would be daunting, the experts said, but the cost would be small relative to climate action – billions of dollars a year against trillions.

The researchers emphasised that geoengineering only masked the symptoms of the climate crisis, and did not tackle the root cause – the burning of fossil fuels. Geoengineering could only complement the cutting of emissions, not replace it, they said.

If geoengineering was halted abruptly but emissions had not been reduced, there would be a termination shock of rapidly rising temperatures – 1-2C within a couple of decades – that would have severe effects on people and ecosystems unable to rapidly adapt.

"This is not a question of whether [solar geoengineering] is safe, as it is clearly not without risks," said Prof Keith Shine, at the University of Reading, who led the report. "However, there may come a point where those risks are seen to be less severe than the risks of insufficiently mitigated climate change."

"If policymakers did take the decision to deploy, a scientifically informed, globally coordinated and internationally agreed-upon strategy would be essential both to achieve global cooling and avoid potentially large undesirable regional climate impacts," he said.

Geoengineering has divided the scientific community. The Royal Society report does not take a position but aims to set out the current state of understanding to better inform debate.

The report considers the two types of geoengineering seen as most likely to be feasible and effective. Using high-altitude aircraft to pump sulphur dioxide (SO_2) into the stratosphere would cause reflective particles to form, bouncing a fraction of the sun's heat back into space.

Explosive volcanic eruptions are natural examples of this process, and studying these has helped researchers understand the impact. For example, the eruption of Mount Pinatubo, in the Philippines, in 1992, which pumped 15m tonnes of SO_2 into the atmosphere, lowered global temperature by about 0.5C for a couple of years. About 8m to 16m tonnes a year is thought to be needed for a significant geoengineering programme.

The second type of geoengineering considered is marine cloud brightening, where salt particles produced from seawater are thrown up into the lower atmosphere. These particles enable water vapour to nucleate and form clouds, which reflect sunlight. The effect is seen today in the ribbons of clouds created by the pollution from shipping.

The global climate is the result of the interaction of many different ocean, land and air systems across the planet. Research has found that stratospheric sulphur dioxide injection deployed only in the southern hemisphere could cause North Atlantic hurricanes to increase in frequency and intensity. Deployment in only the northern hemisphere could lead to droughts in the Sahel region of north Africa, while deployment only in the tropics could cause droughts in the Mediterranean.

Marine cloud brightening in the south-east Atlantic alone could result in the dieback of the Amazon, releasing a huge amount of carbon, while deployment in the eastern Pacific only could result in an enormous La Niña, a climate phenomenon with global consequences.

“You would not want it to be done by a single rogue actor”, who thought they were acting in their own best interests by trying to reduce temperatures in one region, said Prof Jim Haywood at the University of Exeter, part of the Royal Society team.

The scientists said that even if a global deployment was internationally agreed and coordinated, many uncertainties remained about how much it would cool the Earth and what regional impacts would remain. In April, the UK Advanced Research and Invention Agency launched a £50m government-funded geoengineering programme, which will include small-scale outdoor experiments. Prof Mark Symes, who is leading the Aria programme, said the looming threat of climate tipping point was a strong reason to research solar geoengineering.

Ross Rutherford

ESR Newsletter Editor

11 November 2025