IMPERIAL
Grantham Institute

Climate communicators' evidence bank

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Introduction

The need for easy access to robust, up-to-date facts and figures was identified as part of a project working with climate scientists to support them in sharing their expertise in meaningful and compelling ways with wider audiences.

This evidence bank provides evidence on a range of topics related to climate change that come up frequently in the media and wider public debate: the state of play on carbon budgets; the level of deployment of low-carbon technologies; and the climate impacts that are already being experienced and are expected to be experienced in future.

In this edition, we have also included some information about President Trump's record on climate and low-carbon technology deployment during both his previous term and his current term in office.

Using the evidence bank

What is this evidence bank for?

The purpose of this evidence bank is to make it easy to find robust, up-to-date facts and figures on key aspects of climate change mitigation, impacts and adaptation.
It also provides short briefings on relevant contextual information (such as government policies) that it might be useful to be aware of before engaging on public platforms.

Who is this evidence bank for?

This evidence bank is for communicators who need to comment or share perspectives on topical issues relating to climate change, such as government announcements, news stories and other current events.

How to use this evidence bank

The facts and figures in this evidence pack may be useful for climate communicators when preparing for "set piece communications opportunities" such as media interviews, panel discussions and keynote addresses. It is designed to be used alongside our "Communicating on 1.5°C" toolkit for climate scientists.
We do not suggest that users attempt to memorise all the facts presented here! Rather, we hope it will provide a useful list from which communicators can select appropriate facts to illustrate their speaking points. Each section contains facts at the global level (for engagement with international audiences) and at the UK (for domestic audiences).

How was this evidence bank developed?

The need for easy access to robust, up-to-date facts and figures was identified through a series of focus groups with climate scientists, which explored challenges to effective communication experienced by the scientific community.

The evidence presented in this document was identified through a desk-based process and reviewed by Nicole Kuchapski, Cait Hewitt, Dr Caterina Brandmayr, Dr Robin Lamboll, Dr Ben Clarke and Dr Clair Barnes.

Updates and additions

We plan to update this document periodically. If you have any feedback or suggestions for topics to include in the future, please leave us some comments here: https://forms.office.com/e/XwFsuvYXjX

1. Progress towards 1.5°C & Carbon budgets

Global

Global warming to date

- Human-induced global warming is currently estimated at 1.36°C.[1]

Carbon budgets

- To limit warming to 1.5°C, our remaining carbon budget would be exhausted in 2025 based on current emissions.[2]

Global warming projections

- On our current trajectory, we are predicted to reach 1.5°C of warming in approximately 2030.[3]
- Without changes to current pledges to reduce emissions, the chance of limiting warming to 1.5°C is virtually zero.[4]
- If we do not improve the ambition and delivery of emissions reductions, the world will be on course for a temperature increase of 2.6-3.1°C over the course of this century.[5]

Emission reduction commitments

- The UNEP (United Nations Environment Programme) projects that, under current policies, 11 of the G20 nations will miss their 2030 emission reduction targets (Nationally Determined Contributions, or NDCs), including the UK.[6]
- Current NDCs are predicted to reduce 2030 emissions by up to 10% (compared to 2019 emissions). This is not enough to meet the Paris Agreement goals: a 28% reduction is needed to limit warming below 2°C, while a 42% reduction is required to limit warming below 1.5°C. These estimates have not changed since the 2023 emissions gap assessment.[7]
- The upcoming 2035 NDC targets need to reduce global emissions by 57% and 37% (compared to 2019) to keep warming below 1.6°C* and 2°C, respectively.[8]
- At COP29 (November 2024):
    - three countries (the United Kingdom, Brazil and the United Arab Emirates) announced new 2035 NDC targets. [9] (See below for more on the UK's NDC).
    - Canada, Chile, the European Union, Georgia, Mexico, Norway, and Switzerland announced that their forthcoming NDCs would introduce economy-wide emissions reduction targets in line with limiting warming to 1.5°C.[10]
    - Countries from the G-ZERO coalition, including Bhutan, Madagascar, Panama, and Suriname, announced that they had already achieved net zero greenhouse gas emissions.[11]

* This is a pathway that allows for temporary overshoot of 1.5°C

Policy context - Global

- All parties to the Paris Agreement must submit an NDC every five years representing their 'highest possible ambition' to reduce emissions. Each new NDC must represent a 'progression' from their previous NDC. The 2035 NDCs were due for submission in early 2025 ahead of COP30. As of 23 September 2025, 34 countries have submitted a 2035 NDC target.
- At COP29 agreements were made to scale up climate finance, with parties agreeing to triple finance to developing economies from USD 100 to USD 300 billion by 2035. Parties also agreed to work together to scale up finance for low-emissions projects in developing economies from both public and private sources to USD 1.3 trillion per year by 2035.

UK

Emission reduction commitments

- At COP29, Prime Minister Keir Starmer announced the UK's headline 2035 NDC target to reduce all greenhouse gas emissions by at least 81% by 2035, compared to 1990 levels.[12]
- The UK also has a legally binding target to achieve Net Zero greenhouse gas emissions by 2050.[13] Scotland has its own target to become a net zero economy by 2045, reflecting its greater capacity for emissions reductions compared to the UK.[14]

Progress on cutting emissions

- The UK has achieved all three of its carbon budgets to date (encompassing the period from 2008 to 2022). A major contributor has been the phasing out of coal power and increases in renewable electricity generation. The UK phased out coal power more quickly than almost every other nation and was the first G7 country to phase-out coal power.[15]
- In 2024, the CCC warned that the UK was not on track to achieve its 2030 NDC goal[16] and the UNEP predicted that the UK would miss its 2030 NDC target.[17] Since this, good or moderate progress has been made on 20 of the 35 priority recommendations made by the CCC in 2024.[18]

Future emission reductions

- The CCC highlight transport, buildings, and agriculture as key sectors to decarbonise to meet the UK's next emissions reduction milestone in 2027.[19]

Policy context - UK

- The UK's 2035 NDC was published in January 2025. The headline target was at least an 81% reduction of greenhouse gas emissions by 2035, compared to 1990 levels. The NDC included a commitment to publish an updated cross-economy plan with policies and proposals to meet future carbon budgets and the 2030 and 2035 NDCs in due course.
- The government is due to agree the seventh carbon budget (for 2038-2042) in 2025. The CCC issued its advice in February 2025, suggesting that the government set the 2038 to 2042 carbon budget at 535 MtCO2e, including emissions from international aviation and shipping. The net costs of Net Zero under this pathway were estimated at 0.2% of UK GDP per year on average, with early investment, particularly from the private sector, yielding future savings. Parliament must approve or reject the recommended level by 30 June 2026.

Further resources - Progress towards 1.5°C & Carbon budgets

- Climate Change Tracker: This website provides up-to-date data on climate indicators based on the IPCC AR6 methods, in collaboration with the Indicators of Global Climate Change (IGCC) initiative.
- UK Climate Change Committee : The UK's independent adviser on climate change, which regularly reports to Parliament on the UK's progress in reducing emissions and adapting to climate change.
- European Scientific Advisory Board on Climate Change: An independent body which provides the EU with scientific knowledge and advice about climate change, evaluates EU climate policy, and assesses how best to meet targets.
- House of Commons Library Research Briefing: The UK's plans and progress to reach net zero by 2050 (12 August 2025). This briefing summarises the context of net zero, the plans in place to reach this goal, and current progress.
- Grantham Institute Background Briefing: Limiting temperature increase to 1.5°C above pre-industrial levels. A short explainer on the Paris Agreement 1.5°C target and our progress towards it.
- Grantham Institute Background Briefing: Pledges and policies: are we on track to meet climate goals? A short overview of global pledges and policies to reduce emissions and the size of the gap remaining to meet climate goals.
- Grantham Institute Background Briefing: Why is achieving net zero necessary? A short explainer on the rationale for net zero.
- Granthan Research Institute Explainer: Why should the UK take action on climate when it is responsible for only a relatively small fraction of today's global emissions? A short explainer on the UK's international roles and responsibilities.
- The UNFCCC's 2024 NDC synthesis report, which summarises information from the available NDCs as of October 2024, including projected emissions levels and means of implementation.

2. Low-carbon technology deployment & mitigation action

Global

Deployment of renewables

- Between 2010 and 2023, global solar photovoltaic capacity increased 40 times and wind power six times.[20]
- A target to triple renewable energy capacity by 2030 was agreed in 2023 at COP28.[21] The IEA forecasts that growth in renewable energy capacity is currently on track to fall just short of this goal (growing by 2.7 times by 2030).[22]
- In 2024, renewable energy made up 32% of global power generation. The IEA predicts that this will rise to 46% in 2030. [23]
- Solar and wind power are predicted to make up 95% of growth in renewable power generation until 2030.[24] The required growth in solar power to reach the COP28 target is already on track to be achieved.[25]
- The exponential growth in renewable energy capacity is rapidly exceeding modelled predictions. For example, twenty years ago the IEA projected that electricity from solar power would reach 929 TWh by 2030, but by 2022 solar power generation had already far exceeded this, reaching almost 1,300 TWh.[26]
- China is the world's largest investor in renewable energy. In 2023, China commissioned as much solar PV as the entire world did in 2022.[27]
- Reuters report that solar and energy storage accounted for 84% of new generation capacity in the US in 2024.[28]

Cost reductions in renewables

- Renewable energy costs are lower than ever; 91% of new renewable electricity projects provide cheaper electricity than the average fossil fuel plant.[29]
- The global average cost of electricity for solar power decreased by 90% from 2010-2024, with decreases of 70% for onshore wind and of 62% for offshore wind over the same period. In 2024, all three renewable power sources provided cheaper energy on average than fossil fuels. The costs of battery storage projects declined by 93% from 2010-2024.[30]
- Chinese solar panel and wind turbine prices have decreased by 60% and 50% respectively from 2022 to 2024, though wind turbine prices in Europe rose over this period.[31]
- Cost reductions for renewable energy technologies have consistently outperformed the predictions. For example, annual cost reductions for solar photovoltaics (solar panels) of 2.6% had been predicted between 2010 and 2020. Costs actually declined by 15% per year over this period.[32]

Uptake of electric vehicles (EVs)

- Sales of electric cars (plug-in hybrid and battery electric vehicles) have increased rapidly, up from 550,000 globally in 2015 to almost 3 million in 2020 (almost 5% of total sales), and 17.5 million in 2024 (over 20% of all sales).[33] EV sales are now predicted to make up 56% of global passenger-vehicle sales by 2030 and 70% by 2040.[34]
- The uptake of EVs has exceeded earlier expectations. In 2020, BNEF predicted that 10% of new car sales in 2025 would be for EVs.[35] In fact, as soon as 2022 EVs represented 14% of new car sales.[36]
- Globally, the lifetime emissions of a medium-sized battery electric car sold in 2023 will be half as much as a conventional equivalent.[37]

Cost reductions in electric vehicles

- Electric cars are getting cheaper over time. The IEA estimate that in China, almost 66.6% of electric cars sold in 2024 had a cheaper upfront price than their average conventional car equivalent. However, electric cars remain more expensive in other countries, with around 20% of electric SUVs being cheaper than conventional equivalents in the US. A rapid transition to electric vehicles (supported by policy) is key to bringing more affordable models to market.[38]
- The total cost of ownership includes fuel costs, insurance, maintenance and depreciation as well as the upfront price of vehicles. Higher fuel efficiency and lower maintenance costs can mean that electric vehicles are cheaper to run than conventional cars. When petrol prices are higher than electricity prices there are further cost benefits.[39]

Policy context - Global

- COP28 Global renewables and energy efficiency pledge – this details the COP28 commitments regarding renewable energy and energy efficiency.
- International Energy Agency Global EV Policy Explorer – A summary of the key announced policies related to EVs.

UK

Deployment of renewables

- In 2023, renewable energy made up 48% of power generation in the UK.[40]
- In 2024, the government announced a mission to deliver clean power by 2030. This transition will primarily rely on increased deployment of offshore wind, supported by deployment of onshore wind and solar power alongside storage solutions such as batteries and making better use of the opportunity to flex demand to match clean power supply.[41]
- The 2024 renewable energy auction was the largest to date.[42] Reforms to the auction system have been made for the 2025 renewables auction - the BBC report that a spokesperson for DESNEZ said these reforms would "enable a competitive auction that secures the best possible price for consumers while securing the clean energy we need to get us off the fossil fuel rollercoaster".[43]

Cost of renewables

- The lifetime cost of building and operating onshore wind, offshore wind and solar developments was estimated by the Office for Budget Responsibility (OBR) in 2023 to be less than that of gas. Importantly, this *includes* the additional systems costs relating to the fact that renewables can only operate when the wind is blowing or sun is shining.[44]
- Recent high energy bills in the UK have been driven by increases in fossil fuel prices after Russia invaded Ukraine in 2022. The price of electricity in the UK is set by gas generation, so when gas prices go up, so does the price of electricity.[45]

Uptake of electric vehicles (EVs)

- The Government in 2025 confirmed that the UK was the largest EV market in Europe in 2024.[46]
- The uptake of EVs in the UK has exceeded expectations.[47] Sales of electric cars (battery electric and plug-in hybrid) have been rapidly increasing in the UK, from 29,000 in 2015 to 178,000 in 2020, and 550,000 in 2024 (19.6% of all new cars sold in 2024).[48] In 2025, the CCC calculated that the number of electric cars on the road in the UK doubles every two years.[49]
- This rapid growth is already having a meaningful impact on emissions, according to the CCC, who find that over recent years the emissions savings from EVs have doubled every two years.[50] It should also be noted, however, that the CCC also states that despite this "promising" progress, emissions reductions from surface transport will need to make up the majority of reductions between now and 2030, which will require the uptake of electric vehicles to "accelerate fast".[51]

Cost reduction of electric vehicles (EVs)

- Charging a medium-sized electric car at home can cost less than half the price (~8p per mile) of refuelling an equivalent petrol vehicle (~13p-17p per mile, as of January 2024). Some suppliers offer charging tariffs of under 3p per mile. Charging an EV on the public network costs about the same as fuelling an equivalent petrol car[52], and a new public chargepoint is added every 29 minutes[53]. Drivers can save up to £1,100 a year charging an electric car at home compared to buying petrol.[54]
- Manufacturers are increasingly releasing new, lower-cost EVs on the market.[55] The cheapest electric cars sold in the UK in 2023 retailed for £27,000-£30,000, although the IEA calculate that the price of EVs showed little change between 2023 and 2024.[56]
- Price drops for EVs are closing the price gap between electric and conventional vehicles in the second-hand EV market.[57] In some cases EVS are substantially cheaper, with differences of almost £600 reported by Autotrader.[58]

Domestic heating

- As of 2022, only 52% of English homes were energy efficiency rating band C or higher, with the majority of homes falling into Band C and little growth in bands A and B. The government's aspiration is for as many homes as possible to achieve at least a Band C classification by 2035, and for all fuel-poor homes to be at least Band C by 2030.[59]
- Heat pump installations in the UK increased by 56% in 2024, driven by increased support from schemes including the Boiler Upgrade Scheme, although the UK remains significantly behind other European countries in heat pump installation.[60]

Policy context - UK

- The Clean Power 2030 Action Plan was published in December 2024.
- The Government has created a new publicly owned energy company, Great British Energy, to boost clean energy deployment.
- The Zero Emissions Vehicle (ZEV) mandate requires 80% of new cars and 70% of new vans sold in the UK to be zero emission by 2030, increasing to 100% by 2035. Sales of new petrol and diesel cars will be phased out by 2030, though small and micro-volume manufacturers, including supercar brands, are exempt from the 2030 phase-out. Hybrid cars will continue to be sold until 2035.

Further resources – low-carbon technology deployment and mitigation action

- IPCC Fact Sheets on Mitigation of Climate Change, including information on agriculture, buildings, carbon dioxide removal, demand side responses, energy, finance & investment, industry, transport and urban systems.
- International Energy Agency Renewable Energy Progress Tracker (October 2024): Up to date summary of historical renewable energy deployment, current deployment, and renewables ambitions by 2030.
- International Energy Agency World Energy Outlook (October 2024): Annual report of global energy analysis and projections in the context of emissions, energy security, and economies.
- International Energy Agency Global Energy Review 2025 (March 2025), which summarises the trends across the energy sector in 2024.
- UK Digest of United Kingdom Energy Statistics (DUKES) – Government data sets on UK energy production and use. (31 July 2025)
- National Energy System Operator (NESO), Clean Power 2030: Advice on achieving clean power for great Britain by 2030 advice on what will be needed in generation, flexibility and the grid to meet achieve the 2030 clean power target.
- House of Commons Research Briefing: Energy efficiency of UK homes (24 Feb 2025)
- House of Commons Research Briefing: Electric vehicles and infrastructure (20 Jun 2025)
- House of Commons Research Briefing: Help with energy efficiency, heating and renewable energy in homes (28 November 2024)
- Grantham Institute Background Briefing: How cost-effective is a renewables-dominated electricity system in comparison to one based on fossil fuels? A short explainer on renewable energy system costs.
- Grantham Institute Background Briefing: How reliable is a renewables-dominated electricity system in comparison to one based on fossil fuels? A short explainer on flexibility and intermittency
- Grantham Institute Background Briefing: How well equipped is the UK charging infrastructure to support greater uptake of electric vehicles? A short explainer on the rollout of charging infrastructure in the UK.
- Grantham Institute Background Briefing: How well suited are heat pumps to UK homes and how economical area they? A short explainer on heat pumps.

3. Impacts of climate change

i. What impacts are we seeing already?

Global

Scale of climate change impacts

- Almost everyone is experiencing the negative impacts of climate change; analysis by Climate Central found that 96% of the global population experienced climate-change-affected temperatures in 2021-22.[61] On the 13th August 2024, half of all people worldwide (4.1 billion people) experienced unusual temperatures made at least three times more likely by climate change.[62]
- The 2024 European State of the Climate report finds Europe is the fastest-warming continent on Earth; since the 1980s Europe has been warming twice as fast as the global average.[63]
- Approximately 3.3–3.6 billion people live in contexts that are very vulnerable to climate change[64] – over 40% of the world's population.[65]

Extreme weather events – rainfall and flooding

- In the summer of 2025, heavy monsoon rain in Pakistan led to flooding which killed around 300 people, injured a further 700 people, and led to the collapse of over 1600 houses. An attribution analysis concluded that the monthly rainfall was around 22% more intense than it would have been without climate warming, and highlighted Pakistan's extreme vulnerability to flooding.[66]

Extreme weather events – extreme heat

- The IPCC has concluded that "it is *virtually certain* that hot extremes (including heatwaves) have become more frequent and more intense across most land regions since the 1950s" with "*high confidence* that human-induced climate change is the main driver". In other words, every heatwave in the world is now stronger and more likely to happen because of human-caused climate change.[67]
- February and March 2025 saw extreme heat across continental Eastern Africa, with average weekly temperatures exceeding 32°C in South Sudan. This heatwave was made at least 2°C hotter and at least 10 times more likely by climate change. This heatwave was associated with adverse health effects, impacts on malnutrition and education, disproportionately affecting women and those impacted by armed conflict.[68]
- In the 2025 European summer heatwave, climate change nearly tripled the number of heat-related deaths and increased heatwave temperatures by up to 4°C.[69]

Extreme weather events – storms

- The 2024 typhoon season in the Philippines was unprecedented, with six typhoons hitting the country within 30 days and the highest number of simultaneous storms occurring since records began in 1951. These storms impacted over 13 million people, with the storms Trami and Kong-Rey alone killing more than 160 people, displacing more than 600,000, and impacting

over 9 million people across the region. Storms of this intensity are 1.7 times more likely due to climate change.[70]

Sea level rise

- Global mean sea level has increased by an estimated 0.20m from 1901-2018.[71]
- Scientists predict that the Maldives, which is inhabited by half a million people, is likely to be the first country to lose its land because of climate change-related sea level rise.[72] The country is already trying to adapt, having constructed a climate-resilient artificial island raised 2m above sea level. Climate change in the Maldives is also causing severe coral bleaching, which has prevented important development projects from continuing.[73]

UK

Costs of climate change

- Dealing with climate change is expensive for the UK. Because of climate change, the UK's economy is already about 1.1% smaller than it could be. That's the estimated cost of the damage caused by climate change, according to a 2022 study.[74] (The study also projects that this gap will widen to 3.3% by 2050 and 7.4% by 2100).
- Aviva estimate the economic cost from extreme weather events in the UK between 2014-2023 at $2 trillion.[75]

Extreme weather events – rainfall and flooding

- October 2023 to March 2024 was the wettest period on record for the UK and the third on record for Ireland. The storm rainfall in the autumn/winter of 2023 was made about 20% heavier by human-caused climate change. This increased rainfall and flooding significantly impacted farming in the UK, reducing crop yields and requiring land restoration. For example, vegetable production in the UK dropped by 4.9% from 2022 to 2023. In response to this damage the government mobilised a one-off grant of £60 million to help farmers recover.[76]
- The Bank of England found that flooding events between 2011-2021 significantly increased the probability of business termination for both small- and medium-sized firms. Flooding events were also associated with reduced turnover for large and medium-sized firms in the year of the flooding event.[77]
- Around 33.3% of railway and road kilometres are currently at risk of flooding.[78] A FOI request submitted by Round Our Way, a UK non-profit organisation that supports people impacted by climate change, revealed that almost 7,000 trains were cancelled in 2024 due to flooding, causing delays of 187,475 minutes – adding up to over a third of a year.[79]
- Currently, 6.3 million properties are at risk of flooding.[80]

Extreme weather events – extreme heat

- The July 2022 heatwave involved a prolonged period of heat from July 10-25th which peaked on July 18-19th. This was the first time that temperatures of 40°C and above were recorded in the UK. The heatwave contributed to wildfires that destroyed 20 homes in East London and up to 1,256 excess deaths. The event was made at least 10 times more likely and ~2°C hotter by climate change.[81]

- In the June-July 2025 heatwave, temperatures in London reached 34.7°C. Climate change tripled the number of heat-related deaths, causing an estimated total of 260 heat-related deaths.[82]
- The CCC find that there were nearly 3,000 heat-related deaths in 2022.[83]

Exposure to impacts overseas – disease risk

- Modelling suggests that London is currently warm enough for mosquitos and ticks to survive. If these species were to establish, there would be an increased risk of spreading diseases like Lyme disease and dengue fever.[84]

Exposure to impacts overseas – food security

- Extreme weather in 2018 (including extreme summer heat and dry spells), may have increased household food bills by an estimated £7.15 a month according to the Centre for Economics and Business Research (Cebr).[85]
- The ECIU estimate that, compared to 2021, British households are likely to have paid an extra £361 for food in 2022 and 2023 due to the impacts of climate change domestically and internationally [86] – almost £7 per week.
- The CCC highlight that over half of the UK's top quality agricultural land is at risk of flooding today, with this figure expected to increase by 2050. High rainfall and flooding between October 2022 to March 2024 led to the 2023-2024 arable harvest being the second worst since modern harvest records began.[87]
- Early analysis from the ECIU predicts that 2025 may see a historically poor harvest after the warmest, driest spring for 50 years.[88]
- In July 2025, the ECIU reported that food price inflation had increased for the third month in a row, reaching its highest level since Feb 2024.[89]

Further resources – impacts of climate change

- WMO State of the Global Climate 2024 An annual summary and update of key climate indicators, including surface air and ocean temperatures, sea ice extent and sea level.
- Attribution studies of recent extreme weather events: World Weather Attribution
- World Weather Attribution: Guidance on discussing extreme weather events and their links to climate change. Guidance from WWA on how to discuss extreme weather, climate change, and attribution studies for the media.
- National Centers for Environmental Information: Global climate report – An analysis of global temperatures and precipitation, including historical data.
- Carbon Brief: How climate change affects extreme weather around the world – Global analysis of extreme weather events, and the proportion that can be linked to climate change.
- European Commission: Consequences of climate change – A summary of the natural, social, business, and territorial consequences of climate change.
- Met Office: State of the UK Climate 2024 – A review of the climate and significant meteorological events of the year.
- Met Office: Impacts of climate change – A summary of the current and future impacts of climate change.
- Vousdoukas, M.I., Athanasiou, P., Giardino, A. et al. Small Island Developing States under threat by rising seas even in a 1.5 °C warming world. Nat Sustain 6, 1552–1564 (2023). https://doi.org/10.1038/s41893-023-01230-5. This paper assesses future flood risk due to sea level rise for SIDS, and estimates the damage that could be prevented by limiting warming to 1.5°C.
- Grantham Institute Background Briefing: Autumn and winter storms in the UK 2023-24. A short explainer exploring the role that climate change played in the very active storm seasons experienced in the UK and Ireland.
- House of Commons Library Research Briefing (14th July 2025): Heatwaves in the UK. A short briefing explaining how heatwaves occur and their impacts in the UK.
- Grantham Institute Background Briefing: UK and European heatwave 2025. A summary of the impacts of the UK and European heatwave, the role climate change played in these impacts, as well as the impact of heatwaves on people, productivity, and the economy.

ii. What future projected impacts are expected?

Global

Extreme heat

- Extreme heat can cause heatstroke, disrupt sleep, damage organs, worsen chronic conditions, and can even cause death. It may also prevent healthcare services from operating, for example through power shortages, transport disruption, water shortages, and health impacts on healthcare workers.[90]
- Older and less-abled adults, children, pregnant people, those with certain medical conditions, and people taking certain medications are at the highest risk of these negative health effects.[91]
- People with higher exposure are also at greater risk, including those who: work outdoors; live in poor quality housing; are poor, displaced or experiencing homelessness; and athletes and attendees of outdoor events.[92]
- High humidity can make the impacts of extreme heat worse.[93]

Impacts at 1.5°C	Impacts at 2°C	Impacts at 3°C
Almost 14% of the world population could be exposed to severe heat waves at least once every 5 years.[94]	Almost 37% of the world population could be exposed to severe heat waves at least once every 5 years (around 1.7 billion more people than in the 1.5°C scenario).[95]	
Across the world's largest cities, annual longest heat wave duration could be 16.3 days (global average). The average city may experience 4.9 heat waves per year.[96]	Across the world's largest cities, annual longest heat wave duration could be 18.4 days (global average). The average city may experience 5.4 heat waves per year.[97]	Across the world's largest cities, annual longest heat wave duration will be 24.5 days (global average). The average city may experience 6.4 heat waves per year.[98]
547 million people will be exposed to 30 or more days at 35°C+ each year.[99]		701 million people will be exposed to 30 or more days at 35°C+ a year.[100]

Extreme rainfall

- Extreme rainfall can result in crop damage, soil erosion, and increased flood risk. Flood events may result in property damage and mortality.[101]

Impacts at 1.5°C	Impacts at 2°C
Average rainfall will increase by approximately 2%, but the frequency of rainfall extremes will increase by an estimated 17%.[102]	Average rainfall will increase by approximately 4%, but the frequency of rainfall extremes will increase by an estimated 36%.[103]

Sea level rise

- Even if warming is kept below 1.5°C, sea levels will rise by 15–23cm by 2050, putting coastal communities at risk of flood damage and loss of land.[104] Countries at risk include Pakistan and the Netherlands, as well as small islands with low-lying land areas like Fiji.[105]

Transmissible diseases

Impacts at 1.5°C	Impacts at 2°C
Climate warming can increase the transmission of certain diseases (including malaria, dengue, chikungunya, yellow fever, Zika, West Nile virus, and Lyme disease) by increasing species' ranges, activity periods, or altering the seasonality of disease transmission cycles.[106]	Many climate-sensitive health risks (including undernutrition, malaria, dengue, chikungunya, yellow fever, Zika, West Nile virus, and Lyme disease) are predicted to be greater under 2°C compared to 1.5°C of warming.[107]

UK

Costs of climate change

- Dealing with climate change is expensive for the UK. Because of climate change, the UK's economy is already about 1.1% smaller than it could be. That's the estimated cost of the damage caused by climate change, according to a 2022 study.[108] (The study also projects that this gap will widen to 3.3% by 2050 and 7.4% by 2100).[109]
- The Office for Budgetary Responsibility calculated the costs of climate damage over the next 50 years, projecting that under 2°C of warming debt would increase by 31% of GDP, while under 3°C of warming this would rise to 56% of GDP. These estimates took indirect, direct and financing costs into account, but are likely to be underestimates, with the authors emphasising that the estimates of the risk of climate damages are "skewed to the downside"[110].
- If unchecked, climate change could impact the economic output of the UK by up to 7% of GDP by 2050. [111]

Extreme heat

- The CCC predict that heat-related deaths could exceed 10,000 a year in 2050.[112]

Impacts at 1.5°C	Impacts at 2°C
Average annual heat-related mortality will increase from ~1400 (in 1990–2019) to ~2500.[113]	Average annual heat-related mortality will more than double from ~1400 (in 1990–2019) to ~3700.[114]
Summer maximum temperatures are likely to increase. Summer maximum temperatures will be approximately: • **32.9°C in London** (2.3°C hotter than 1981-2000 baseline of 30.6°C), • **31.3°C in Manchester** (2.7°C hotter than 1981-2000 baseline of 28.6 °C), and • **26.2°C in Aberdeenshire** (1.8°C hotter than 1981-2000 baseline of 24.4°C.[115]	Summer maximum temperatures are likely to increase. Summer maximum temperatures will be approximately: • **33.8°C in London** (3.2°C hotter than 1981-2000 baseline of 30.6°C), • **31.5°C in Manchester** (2.9°C hotter than 1981-2000 baseline of 28.6 °C), and • **26.9°C in Aberdeenshire** (2.5°C hotter than 1981-2000 baseline of 24.4°C.[116]
	The schools most at risk of extreme heat[††] may experience internal temperatures above 26°C for up to 50% of school days, and up to 15 school days above 35°C in an average year.[117]
	Average additional direct fiscal costs[‡] of heatwaves could be £420 million per year (2024-25 prices).[118]

Extreme rainfall

- The CCC predict that around 50% of railway and road kilometres and around 8 million properties (around 25% of all properties) will be at risk of flooding in 2050.[119]

[††] Risk categorisations were based on the Generalised Additive Model (GAM) simulated ensemble mean risk (expected annual total number of days the school overheats) for the 35°C overheating threshold and the 2°C global warming. High risk = the top 10% of schools in the risk metric (i.e. above the 90th percentile of the risk metric).

[‡] Direct costs include, for example, increased costs on the health system. Indirect costs might include losses to the economy from reductions in productivity and employment.

Impacts at 1.5°C	Impacts at 2°C
England and Wales could receive a projected 8 days (currently 7) per year of intense and prolonged rainfall that could lead to river flooding.[120]	England and Wales could receive a projected 9 days per year of intense and prolonged rainfall.[121]
	Climate change is the dominant factor affecting future flood risk. Under 2°C of warming, Expected Annual Damages will increase by an estimated £4.2bn by the 2080s.[122] The areas with the largest future flood risk are Hull, the City of Portsmouth, and Sedgemoor District Council. [123]
	Average additional direct fiscal costs[§] of river and surface flooding could be £260 million per year (2024-25 prices).[124]

Exposure to impacts overseas – disease risk

- Increased temperatures mean the UK will become more suitable for multiple new mosquito species and lengthen activity periods for some species. This may increase the transmission of diseases like chikungunya, dengue, and zika.[125]

Exposure to impacts overseas – food security

- The UK relies on food imports, importing around 35% of its food in 2024.[126]
- The UK is particularly reliant on imports of fruit and vegetables (only 17% and 55% respectively is produced domestically). The Government's UK Food Security Index 2024 notes that "supply can be affected where imports are from countries vulnerable to climate change and extreme weather".[127]

Impacts at 2°C	Impacts at 4°C
Key produce is likely to become harder to grow in the UK's most productive arable regions (the Southeast and East Anglia). Crops like wheat and strawberries are likely to be affected.[128]	Key produce is likely to become harder to grow in the UK's most productive arable regions (the Southeast and East Anglia). Major crops including onions and oats are likely to be affected.[129]

[§] Direct costs might include, for example, the cost of repairing infrastructure or compensating households and businesses for uninsured losses. Indirect costs might include losses to the economy resulting from a reduction in productivity and employment.

Further Resources – future projected risks

- PROVIDE Climate Risk Dashboard : An interactive platform with detailed predictions of how various overshoot scenarios of the Paris Agreement temperature thresholds will impact the environment and economies.
- Met Office Local Authority Climate Service: An interactive resource to help local UK authorities understand current and future climate risks in their area.
- House of Commons Library Research Briefing: Climate change adaptation and resilience in the UK (26 June 2025). This explains the targets for climate change adaptation in the UK, the current policy approach, and an overview of progress.
- UK Health Security Agency Health Effects of Climate Change in the UK: state of the evidence 2023. This report provides evidence, analysis and recommendations based on climate change projections for the UK.
- HM Gov (Jan 2025) National assessment of flood and coastal erosion risk in England 2024

Policy context

Global

- The Adaptation Fund (established 2001) allows climate-vulnerable communities in developing countries to fund climate resilience projects. The fund is financed by governments, private finance, and Certified Emission Reductions (CERs).
- The Early Warnings for All initiative (launched 2022) aims to improve knowledge, monitoring, warning dissemination, and response capabilities for those most at risk from climate change.
- The Loss and Damage fund, designed to improve the negative effects of climate change that cannot be avoided by mitigation and adaptation efforts, was agreed at COP28 in 2023, where US$662 million was pledged for the fund. This was increased to US$731 million at COP29, but still falls far short of the US$150-300 *billion* annual loss and damage costs by 2030 estimated by the High-Level Expert Group on Climate Finance.

UK

- The UK's third National Adaptation Programme (NAP3) details the government's plans to adapt to the impacts of climate change from 2023 to 2028. The fourth NAP will be published in 2028.
- There are also adaptation plans for the devolved nations: Northern Ireland, Scotland and Wales.
- The CCC's assessment concluded that "NAP3 falls short of what is needed."
- The CCC has now started the Independent Assessment of UK Climate Risk that will underpin the UK's Fourth Climate Change Risk Assessment (CCRA4). The assessment will be delivered in 2026.

4. Trump Presidency (2025-2029)

Key actions - First Trump Presidency (2017-2020)

- In 2017, President Trump announced his intention to withdraw the US from the Paris Agreement. UN regulations delayed this withdrawal to November 2020.[130] On his first day in office in 2021, President Biden started the process to re-enter the US into the Paris Agreement, which officially occurred in February 2021 – only 77 days after the withdrawal took effect.[131]
- The New York Times report that the previous Trump administration reversed, revoked, or rolled back 98 rules associated with environmental protection.[132]
- Despite these actions to roll back US climate policies, there were examples of other countries strengthening their commitments during this period:
  - In 2017 Sweden introduced a target to achieve net zero greenhouse gas emissions by 2045 at the latest, and net negative emissions after this. Emissions in 2045 would be at least 85% lower than in 1990.[133]
  - In 2019, the UK made its 2050 net zero greenhouse gas emissions target legally binding. This superseded the previous legally binding target to reduce emissions by 80% compared to 1990 levels by 2050.[134]

Key actions - Second Trump Presidency (2025-2029)

Withdrawal from Paris Agreement

- On 20th January, President Donald Trump signed an executive order mandating the US's withdrawal from the Paris Agreement. UN regulations delay this from occurring for a year after notice of withdrawal is submitted.[135]

Plans to rescind landmark greenhouse gas legislation

- Reuters report that the Environmental Protection Agency is planning to "rescind the long-standing finding that greenhouse gas emissions endanger human health, removing the legal foundation for all U.S. greenhouse gas regulations". The report includes a claim from the EPA administrator that this would save $54 billion annually. Though it requires a period for public comment, if passed this would end limits on greenhouse gas emissions from sources including vehicle tailpipes and power plants. Under President Biden, the EPA calculated that the tailpipe regulations alone would avoid over 7 billion tons of carbon emissions up to 2032.[136]

Ending funding for key scientific observatories

- The New York Times report that President Trump's proposed 2025 budget would close four research observatory stations including the Mauna Loa Observatory - a key location for quantifying atmospheric carbon dioxide levels. These closures would "eliminat[e] the United States' pole-to-pole view of greenhouse gases", and so these stations "cannot easily be replaced". The data from these stations is also used by climate scientists around the world.[137]

Ending funding for renewable energy

- The One Big Beautiful Bill Act ended several sources of funding for renewables projects, energy efficiency improvements, and clean manufacturing.[138]

- In July 2025 the President issued an executive order to end what he described as the “massive cost of taxpayer handouts to unreliable energy sources”, including rescinding or modifying Green Tax Credits, ending taxpayer support for green energy projects, and eliminating any “preferences for wind and solar facilities”.[139] New approvals for offshore wind projects were also paused, and all designated Wind Energy Areas on the U.S. Outer Continental Shelf were rescinded.[140]
- In August 2025, the NYT and CBS reported that the EA was planning on terminating the $7 billion “Solar for All program”. This program was designed to create new or expand existing solar programs to benefit low-income and disadvantaged communities.[141]

Expanding fossil fuel extraction

- In President Trump’s inauguration address, the president promised to expand oil and gas drilling, saying “We will drill, baby, drill.”[142]
- The One Big Beautiful Bill Act increased funding for petroleum extraction with the view to increase reserve levels.[143]
- In August, Reuters reported that the US Dept. of the Interior had begun taking public input for a new five-year offshore oil and gas leasing program.[144]
- This increased fossil fuel capacity is unlikely to counterbalance the reduced renewables capacity due to rollbacks to federal support[145], meaning that unless energy generation from nuclear or geothermal sources can make up the gap, the electricity generation capacity of the US may decrease.

Removing Electric Vehicle (EV) legislation

- In an executive order on 20th January, the President resolved to “eliminate the ‘electric vehicle (EV) mandate’[…] and subsidies […] that favor EVs over other technologies.” [146] In response, CNBC reported that the CFO of Ford linked the removal of tax credits to the possibility of Ford moving some of its EV production out of the US, for example to Europe.[147]

Potential impact of these policy changes

- According to an analysis by Carbon Brief, Trump’s policies are likely to result in an additional 7 billion tons of emissions over the next five years compared to a pathway where the US met its Paris Agreement target of reducing greenhouse gas emissions by 50-52% (from 2005 levels) by 2030. These emissions would incur global climate damages worth more than $1.6tn and would represent a plateauing of the United States’ emissions between 2024 and 2030.[148]

International and state-level response

International Climate Policy and Response

- No other countries have withdrawn from the Paris Agreement, and the US will join Iran, Libya, and Yemen as the only parties outside the agreement.[149]
- China has already surpassed its 2030 targets for the deployment of renewable energy (1,200GW of wind and solar) six years ahead of schedule – this represents more than the entire power generation capacity from all sources in

the US (and more than double that of the EU). Over 60% of global investments of renewable energy last year were in China.[150]

- In July 2025, the European Commission proposed setting a 2040 EU target to reduce net greenhouse emissions by 90% compared to 1990 levels[151].
- In a June 2025 report, the IEA calculated that investment in the electricity sector is expected to reach USD 1.5 trillion in 2025 – around 50% higher than the amount spent on bringing fossil fuels to market. They also calculate that investment in solar energy is expected to reach USD 450 billion in 2025.[152]

State-level action

- Some states have maintained actions to limit greenhouse gas emissions. For example, Rhode Island's Climate Action Strategy aims to improve energy efficiency, green the power sector, increase carbon storage, and facilitate a just transition.[153]

Further resources – Trump presidency 2017-2020

- Carbon Brief (2024) Experts: What does a Trump presidency mean for climate action? – A summary of opinions of how a second trump presidency may impact climate action in the US from scientists, policy experts, and campaigners. Key quote: "Trump's win will not change the global green transition. Green energy is becoming cheaper and more competitive. This economic trend, not politics, will lead action from now on."
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- New York Times (2021) The Trump Administration Rolled Back More Than 100 Environmental Rules. Here's the Full List. – A summary of environmental policies changed by the Trump administration, based on Regulation Trackers for environment-related policy changes from Harvard Law and Columbia Law.
- Carbon Brief (2025) US Policy – The latest news and analysis of US climate-related policy.
- Jeff Tollefson, Nature (2025) Outrage over Trump team's climate report spurs researchers to fight back – A summary of some responses of the scientific community to the climate policies of the second Trump era.

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