

# NERC climate science to solutions

Decades of NERC climate science underpins international climate negotiations and drives the UK's journey to Net Zero



**1987**  
Montreal Protocol to restrain use of ozone-depleting substances.

**1990**  
First report of the International Panel on Climate Change (IPCC) establishes an international consensus on climate science.

**Establish science-based targets and mechanisms to address climate change. Signed by 197 countries**

**1992**  
UN Framework Convention on Climate Change (UNFCCC).

**1997**  
Kyoto Protocol to the UNFCCC.

**2015**  
Paris Agreement to the UNFCCC.

**2015**  
Science-Based Targets Initiative launched, to support companies to set challenging emissions reduction targets.

**2021**  
IPCC report describes unprecedented climate change.

## NERC science plays a prominent role in international climate action

NERC research, innovation and training advances climate science and provides solutions for mitigation and adaptation

**1930s-70s**  
UK-wide environmental observation mechanisms established e.g. sea level, river flow, species records. Provides unparalleled insight for climate change measurement and prediction.

**1980s**  
Ozone hole discovered in Antarctica through analysis of 30 years of measurements. Prompted international action that also delivered climate benefits.

**Mid 1990s**  
Carbon capture and storage confirmed as a viable option for reducing atmospheric CO<sub>2</sub>. Is now a widely accepted mitigation option and facilities are being developed across the world.

**2004**  
First cross-Atlantic ocean current monitoring system established (RAPID). Has revolutionised understanding of the ocean's role in climate.

**2009**  
New NERC/Met Office partnership for ambitious research and infrastructure. Has delivered world-leading advances in climate and weather modelling, enabling more accurate global climate predictions.

**2010**  
Launch of CryoSat-2 satellite, delivering detailed measurements of sea ice thickness. Has transformed knowledge of how the polar regions are changing, which is critical for understanding and predicting climate change.

**2011**  
Natural Hazards Partnership launched, to provide authoritative research and advice on natural hazards such as storms across the UK. Has saved lives and reduced disruption.

**2020**  
Launch of the Glasgow Geoenergy Observatory, a globally unique facility to understand how heat from shallow mines could help to decarbonise our energy supply.

**2021**  
Launch of new research programmes to help the UK become more resilient to the impacts of climate change, and to expand UK capability in climate financial risk analytics.

## NERC science underpins UK climate mitigation and adaptation

Contributing to the many UN Sustainable Development Goals including:



**2007**  
Government opens up offshore wind development around the UK. Offshore wind now delivers 13% of our electricity.

**2008**  
Pioneering Climate Change Act legally commits the UK to emission reductions and cements the UK's position as an international climate leader.

**2009**  
Science shows that the existing Thames Barrier can continue to protect London until 2070.

**2018**  
Detailed new UK Climate Projections (UKCP18) help governments, businesses and wider society to understand how future climate change will affect them.

**2019**  
UK becomes the first country to commit to net zero emissions by 2050.



# Climate clout

NERC science underpins international science consensus, driving ambitious global climate targets

## 1987: Montreal Protocol

**What is it?** In 1987 an international treaty was agreed to curb the global production of ozone-depleting substances. It is the only UN treaty to have been ratified by all member states. And is widely agreed to be one of the most successful international environmental initiatives.

**What was NERC's role?** The Protocol was prompted by the discovery of a hole in the ozone layer above Antarctica by NERC scientists, using atmospheric data collected over 30 years. NERC-funded research also played a leading role in the success of the Protocol, by identifying how the ozone was being depleted and the consequences for human health, and by contributing to the Protocol's regular scientific updates including identifying new ozone-depleting substances.

**What difference has it made?** The Protocol led to rapid worldwide reductions in the production of ozone-depleting substances. If current recovery continues, the ozone layer will be fully restored by 2075. This recovery will have prevented at least 2 million cases of skin cancer by 2030, and has delivered significant savings by averting damage to crops and buildings. It has also made a major contribution to mitigating climate change: recent research, co-funded by NERC, estimated that the removal of ozone-depleting substances as a result of the treaty will have averted 2.5°C of climate warming by 2100.

### Links:

[UKRI story behind ozone hole](#),  
[Ban on CFCs protects plants' ability to mitigate climate change](#)

## 1992, 1995, 2015: The UN Framework Convention on Climate Change

**What is it?** The 1992 UN Framework Convention on Climate Change (UNFCCC) was agreed in 1992, and has been signed by 197 countries. It is the parent treaty for the 1997 Kyoto Protocol and the 2015 Paris Agreement. The Convention aims to stabilize greenhouse gas concentrations at a level that will prevent dangerous human interference with the climate system, and establishes science-based targets and mechanisms to address climate change.

**What was NERC's role?** NERC science underpins the IPCC assessment reports which provide the basis for the Convention. The following section describes NERC's role in the IPCC reports. The First IPCC Assessment Report played a decisive role in the creation of the Convention in 1990. The Second Assessment Report in 1995 led to Kyoto Protocol in 1997, and the Fifth Assessment Report provided the foundation for the Paris Agreement.

**What difference has it made?** The Convention provides mechanisms for acting on, reporting on and funding climate change action. 191 countries have signed the Paris Agreement, which committed to limiting global warming to less than 2°C above preindustrial levels, and set in motion the movement towards net zero emissions. Through the funding mechanisms, developed countries have pledged \$billions to support developing countries in tackling climate change.

### Links:

[UNFCCC](#)  
[History of the IPCC](#)  
[Key aspects of the Paris Agreement | UNFCCC](#)

## 1990 and 2021: Intergovernmental Panel on Climate Change (IPCC)

**What is it?** The IPCC provides leaders and policymakers with regular assessments on the current state of knowledge on climate change. Reports are developed through a comprehensive and inclusive process, and the summaries are agreed by all of the 195 countries involved. Recognising the significance of its work, the IPCC was jointly awarded the Nobel Peace Prize in 2007. The latest, Sixth Assessment Report presents substantial new evidence of the impact of humans on the climate and the changes that are already affecting weather and climate across the globe.

**What was NERC's role?** NERC's long-term support for earth observation data, research, innovation and training has delivered world-leading scientific advances in climate science that have been central to every IPCC report to date. Our researchers also take a lead role in writing the reports. For example 87% of the UK-based authors of the physical science section of the latest, Sixth Assessment Report, are NERC-funded (see Amanda Maycock).

**What difference has it made?** By establishing an international consensus based on the latest science, the IPCC's reports have been the cornerstone for international climate change negotiations (see UNFCCC), and action by businesses and governments around the world (see SBTI and CCA 2008). By demonstrating the scale and speed of predictions needed, the Sixth Assessment Report provides the basis for the UNFCCC COP26 discussions in November 2021.

### Links:

[History of the IPCC](#)  
[NERC researchers contribute to key UN climate change report BAS case study p.44](#)

## 2015: Science-Based Targets Initiative – driving corporate climate action

**What is it?** The SBTI drives ambitious climate action in the private sector by enabling companies to set science-based emissions reduction targets aligned with Paris Agreement goals. The initiative defines and promotes best practice, provides technical assistance to companies and provides independent assessment and validation of targets.

**What was NERC's role?** The Paris Agreement set a goal to limit global temperature rise to well-below 2°C above pre-industrial levels and preferably to 1.5°C. The goal was based on the science in the Fifth IPCC Assessment Report, which was underpinned by NERC science.

**What difference has it made?** Over 1,000 companies, representing nearly 20% of global market capitalisation, are working with SBTI to reduce their emissions at the pace and scale necessary to prevent the worst effects of climate change. A 2020 analysis found that companies had collectively reduced their annual emissions by 25%, saving an estimated 302m tonnes of CO<sub>2</sub> equivalent.

### Link:

[Sciencebasedtargets.org](https://sciencebasedtargets.org)

# World-leading climate science

Future-proofing the UK with smart climate adaptation and mitigation

## 2007: UK Offshore Wind

**What is it?** In 2007 the UK Government announced an ambitious plan to open up offshore wind development around the UK. It remains a key part of the government's net zero strategy, with a targeted fourfold increase by 2030.

**What was NERC's role?** Decades of NERC funding have delivered a powerful combination of scientific knowledge, solutions and skills that are used by governments, businesses and communities, enabling the industry to grow while protecting key marine species and habitats.

**What difference has it made?** The UK is now the world leader in offshore wind energy. In 2020 13% of the UK's electricity came from offshore wind, a 16-fold increase since 2010. The sector is an engine of clean growth, produces millions of pounds of tax revenues, creates thousands of jobs in coastal communities where levelling-up is a priority, and is a key enabler of the UK's commitment to net-zero greenhouse gas emissions by 2050.

**Links:**

[10-point plan](#)  
[Offshore wind impact case study](#)

## 2008: UK Climate Change Act

**What is it?** In 2008 the UK passed an Act (the CCA 2008) requiring the government to set binding five-year carbon budgets based on the latest science. It was the world's first long term legally binding framework for tackling climate change.

**What was NERC's role?** The Act was prompted by the compelling international consensus presented by the IPCC. NERC research underpins IPCC reports (see IPCC). NERC-funded scientists and climate modelling expertise also play a key role in implementing the requirements of the Act, including setting Carbon Budgets, Climate Change Risk Assessments and the National Adaptation Programme.

**What difference has it made?** The Act prompted action by formalising the UK's approach to tackling climate change. The carbon budgets have helped reduce emissions in the UK, particularly in the power sector where emissions from electricity generation fell by 72% between 1990 and 2019. The Act also cemented the UK's position as an international leader and provided an exemplar for other countries.

**Link:**

[Grantham review of the Act](#)  
[Climate change shifting UK's high-impact weather – Met Office](#)

## 2009: Thames Barrier

**What is it?** In 2009 scientists showed that the existing Thames Barrier could continue to protect London from flooding until 2070, later than originally anticipated. The Thames Barrier began operation in 1984 and protects 1.4 million people and over £321 billion of property. The Barrier will become even more important in future as climate change raises sea levels and increases extreme weather events such as storm surges.

**What was NERC's role?** NERC-funded scientists modelled regional sea-level rise and the effect of storm surges to make a detailed assessment of future flood risk for London. They used a storm surge and river flooding models developed by NERC-funded research institutes.

**What difference has it made?** The Barrier was designed to cope with 1-in-1000 year events until 2030. With the new more accurate modelling, the Environment Agency concluded that a second Thames Barrier would not be needed until 2070, thus avoiding an estimated £10 billion (at 2012 prices) of premature investment.

**Links:**

[Thames Estuary 2100 review](#)  
[Impact case study](#)

## 2018: UK Climate Projections

**What is it?** UKCP18 uses cutting-edge climate science to provide detailed climate change projections to 2100 in the UK and globally. It helps the UK to adapt to the challenges and opportunities presented by climate change by enabling governments, businesses and wider society to understand how future climate change will affect them.

**What was NERC's role?** NERC science and scientists underpin UKCP18. This includes long-term datasets on UK sea level and river flows, hosting data and online tools, and co-authoring the Science Reports that accompany the tools.

**What difference has it made?** UKCP18 has been widely used to inform strategy and decision-making. For example it underpins the government's decision making on climate change mitigation and adaptation, and is used by companies to future-proof investments and infrastructure development.

**Links:**

[Met Office – UKCP18](#)  
[NOC case study p.19](#)  
[Green Finance Strategy](#)

## 2019: The UK's Net Zero commitment

**What is it?** In 2019 the UK became the first major economy to legally commit to ending its contribution to climate change (net zero) by 2050 by offsetting or capturing greenhouse gases emitted.

**What was NERC's role?** The net zero target was based on advice from the UK's independent Climate Change Committee, which drew on the latest climate science and understanding of greenhouse gas mitigation options, and advice from experts including NERC-funded scientists. Our long-term funding for climate research, innovation and training in the UK underpinned all of these, as shown in the rest of this document.

**What difference has it made?** The target will require the UK to bring all greenhouse gas emissions to net zero by 2050, reducing our impact on the climate, setting a challenging benchmark for COP26 negotiations, and reinforcing our position as an international leader in climate change.

**Link:**

[UK becomes first major economy to pass net zero emissions law](#)

# People-powered solutions for climate

NERC also delivers impact by developing people. Our funding for postgraduate training produces highly-skilled specialists who drive transformative change in relation to climate change. For example:



## Dr Amanda Maycock

Amanda credits her interdisciplinary NERC-funded PhD and Independent Research Fellowship with enabling her to become an influential researcher at the cutting edge of climate science. As an Associate Professor at the University of Leeds, she improves understanding of interactions between the atmosphere and the ocean, and how they affect climate. As a Lead Author for the IPCC, she analyses future climate scenarios to bring the latest climate science to decision-makers worldwide via the IPCC's authoritative assessment reports.



## Dr Sally Uren OBE

As Chief Executive, Sally uses skills acquired during her NERC-funded PhD to lead Forum for the Future to deliver its mission to solve complex sustainability challenges such as climate change. She plays a key role in inspiring and equipping others to deliver systems change for sustainability, working with businesses and member organisations in systems as diverse as food, energy, clothing and shipping.

## Climate science to solutions: how NERC science delivers impact

Long-term NERC investment in research, innovation, infrastructure, training and knowledge exchange

- Advances in climate science
- World-leading climate models
- Solutions for climate mitigation and adaptation
- Skilled people

Used by governments, businesses, communities and non-governmental organisations to mitigate and adapt to climate change

Stronger and more resilient economy, society and environment

## Net Zero: Our Commitment

NERC is part of UKRI, which has committed to net-zero carbon emissions by 2040 – a decade ahead of the UK target. All electricity used in our UK estate is already generated from renewables.

## References for green part of timeline

- **1930s-70s:** River flow, hosted by UKCEH [About NRFA | National River Flow Archive \(ceh.ac.uk\)](#), Sea level, hosted by HOC – [Download UK Tide Gauge Network data from BODC, Permanent Service for Mean Sea Level \(PSMSL\)](#), Antarctic ozone hole by BAS [The Ozone Hole – British Antarctic Survey \(bas.ac.uk\)](#)
- **1980s:** [The story behind the discovery of the ozone hole – UKRI](#)
- **Mid 90s:** p.38 of [Planet Earth Issue 1 - 2019 \(ukri.org\)](#), [IPCC\\_AR6\\_WGI\\_SPM.pdf, Global Status Report – Global CCS Institute](#)
- **2004:** <http://www.rapid.ac.uk/index.php>, <https://nerc.ukri.org/planetearth/stories/1814/>
- **2009:** [Joint Weather and Climate Research Programme \(JWCRP\)](#)
- **2010:** [NERC – CryoSat-2 mission reveals major Arctic sea-ice loss \(ukri.org\)](#), [CryoSat Operational Monitoring – Overview \(ucl.ac.uk\)](#)
- **2011:** <https://nerc.ukri.org/research/impact/casestudies/society/boosting-the-uks-ability-to-tackle-natural-hazards1/>
- **2020:** [Glasgow observatory overview | UK Geoenergy Observatories \(ukgeos.ac.uk\)](#)
- **2021:** [Government boosts UK resilience against climate change, CERAF Programme](#)