National Centre for Atmospheric Science

Research and Innovation Strategy 2021 - 2026

Excellence in Atmospheric Science

Introduction

The National Centre for Atmospheric Science (NCAS) is a global leader in atmospheric science and, through our research and innovation, we address many of the biggest questions relating to our environment and rapidly changing world.

Our work brings together expertise from across scientific disciplines, spanning all scales from quantifying chemical reactions in laboratories to global pollution, from detecting the smallest cloud droplets to weather systems, and from local weather impacts to modelling global environmental change.

- We undertake fundamental air pollution science, focusing on the understanding required to inform policy interventions and improve public health.
- We study the processes and interactions that control our weather and how this is affected by climate change. We conduct targeted observations of the atmosphere and advance understanding to improve predictions of weather hazards and help society build resilience to climate change.
- We study the long-term changes in our atmosphere and the impact of human activities. We collect long-term observations and build numerical models of the whole Earth System to inform policy on climate change mitigation and adaptation, including pathways to net-zero.
- We exploit the latest technologies, from laboratory measurements to observing systems and high performance computers, and develop comprehensive numerical models of the atmosphere and environment.
- We collaborate widely, to advance shared research challenges and to meet societal needs more effectively.
- We champion new ideas across our organisation, community, and at the interface of disciplines. We continually adapt our research as new opportunities emerge, forging new partnerships and opening new fields. We are able to turn our attention rapidly to the issues of greatest importance to society.
- We provide independent advice to national and local government, businesses and wider society. We inform and influence global and national decisions, rooted in robust science, that help to deliver a more resilient, healthy and productive environment for all.

Our five year Research and Innovation Strategy identifies the priorities for our cutting-edge research. It sets out how we think ambitiously in response to scientific

challenges and identifies the areas in which we will inform and influence solutions that assist business, policy makers and society with tackling many of the biggest environmental issues of our time.

Our goal is to make discoveries that push the frontiers of current knowledge, developing our understanding of the atmosphere and the environment for the benefit of everyone.

Our research and innovation will provide the UK with new and continued capability to build resilience to climate change, develop clean air, and provide early-warning systems for high-impact weather.

Our strategy directly addresses priorities set out in the NCAS Strategy 2020-2025 and the Natural Environment Research Council (NERC) delivery plan. Our work will also help to realise ambitions set out in wider national strategies such as the UK Research and Development Roadmap, the UK Research and Innovation (UKRI) Corporate Plan, the 25 year Environment Plan, UK Innovation Strategy and Clean Growth Strategy. Internationally, our work will contribute to the scientific evidence required to address the UN Sustainable Development Goals, and the goals of the Sendai Framework for Disaster Risk Reduction and the UN Framework Convention on Climate Change Paris Agreement.

We recognise and celebrate the fundamental importance of partnerships in almost every aspect of our research and innovation work. Long-term partners include UK universities that host our staff and facilities, other NERC Centres, the Met Office and the Science and Technology Facilities Council (STFC). International partners are frequently essential collaborators in our research programmes. We also work closely with government departments and businesses to ensure that our science helps to deliver beneficial outcomes for society. As science and policy agendas continue to evolve we actively seek to develop new multi-disciplinary partnerships that are essential to delivering effective solutions to many environmental challenges.

Our strategy describes our broad ambitions for the next five years, and more specific near-term goals. Our near-term goals will naturally be updated as we advance. Over the last 15 years, we have grown in our role as a UK research centre and established ourselves within the global community. The next five years of research and innovation in atmospheric science are critical, as we collectively address many pressing challenges facing the planet’s future and people today.

Structure and Objectives

Our research and innovation priorities focus on maintaining world-class capabilities, and advancing research in three major interconnected areas of atmospheric science. Thus our strategy is organised around five priority areas:

Underpinning Science and Technology Development

- Observations and Measurements
- Models, Data and Analysis

Research Themes

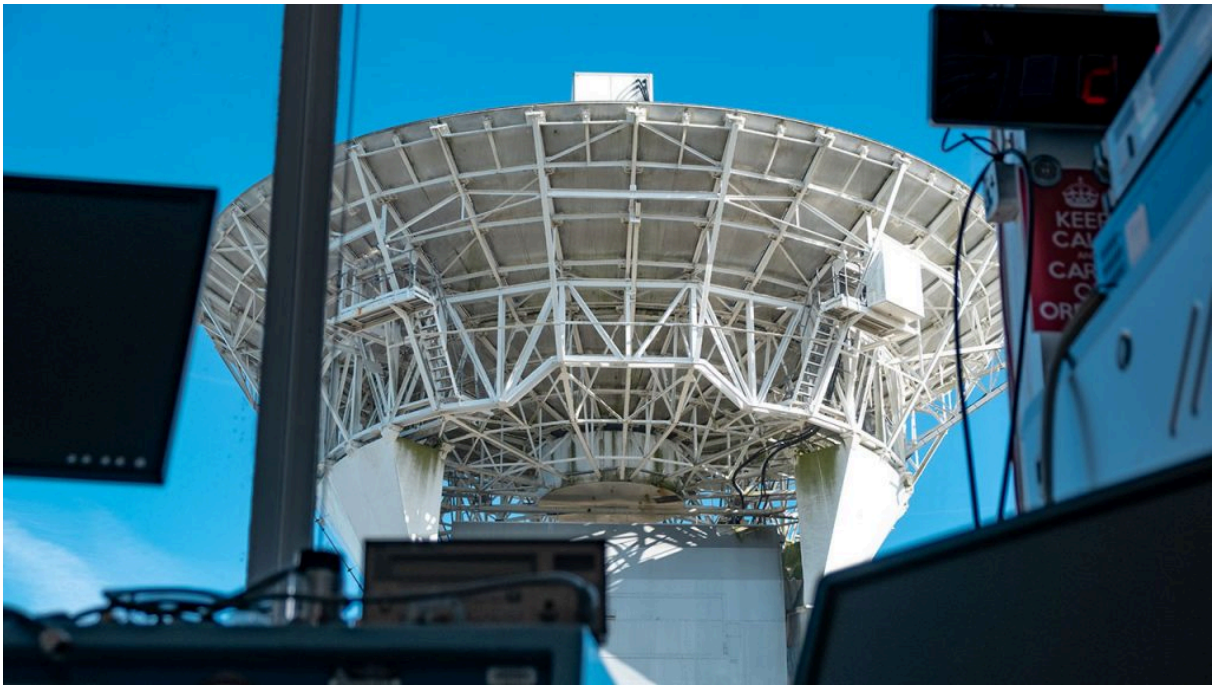
- Air Pollution
- Climate and High Impact Weather
- Long Term Global Change

These priorities are fundamental to our ability to lead and support research and innovation in the wider UK research community, and internationally.

In each of the five priority areas this strategy identifies long-term ambitions, with a focus on the next five years, and near term goals, with a focus on the next one to two years.

Five overarching objectives will guide our research and innovation activities over the next five years. These objectives address especially our corporate goals to Discover, Collaborate and Create Impact:

1. Deliver internationally leading research in atmospheric science and related fields.
2. Ensure we maintain our world-class research capabilities, meeting the evolving needs of the Natural Environment Research Council, UK Research and Innovation, and the wider UK research community.
3. Expand our role in the development and delivery of solutions to the environmental challenges faced by government, businesses and society.
4. Enhance our international leadership roles in research, innovation and impact.
5. Build sustainable strategic partnerships to support and enable the achievement of our objectives.



Underpinning Science and Technology Development

Underpinning support for scientific research activities is provided through a range of NCAS services and facilities. This section describes the research activities which are needed to maintain those services at a level needed to support the ambitions of the NCAS scientific programme.

Observations and Measurements

NCAS supports long-term measurement activities which generate datasets used by both the NCAS scientific programme and the wider community.

In most cases, these contribute to national and international measurement networks, with the data being provided to a variety of international databases. They inform NCAS advice to the UK Government in areas such as Air Pollution, Climate Change and High Impact Weather.

We undertake long term measurements where a) there is clear scientific need; b) the science is important in a wider context and c) we have a unique capability.

To enhance our long-term measurement capabilities, we develop improved software and calibration methods for analysing atmospheric radar and airborne particle probes, new technologies for lidar remote sensing, and analytic tools for model assessment. These activities benefit the wider community and keep the UK internationally competitive.

NCAS also generates fundamental physico-chemical data and supports cutting edge measurement science. In Air Pollution, we develop the core science represented in the Master Chemical Mechanism (MCM), a constantly-updated model

of more than 12,000 gas phase chemical reactions, that is the gold standard measure of atmospheric chemistry performance across the world. The experimental data validates and supports a parallel activity developing theoretical descriptions of gases and aerosols used in the development of pollution and climate models.

Key priorities in measurement science are: i) the validation of ab initio, mechanistic and experimental approaches that generate reaction schemes and parameters for the next generation of air pollution and global models, ii) experimental evaluation of the emissions, properties and life-cycles of atmospheric aerosols and clouds under a range of physical and chemical atmospheric conditions, (iii) the development of new techniques for the traceable calibration of NCAS and UK community gas and aerosol instruments and sensors, (iv) support for new numerical and methodological tools for atmospheric aerosol and cloud observations, including new methods for data analysis from lidar and cloud probes.

Long-term ambitions

- Provide NCAS observations to the highest international standards of measurement quality and data, through the Atmospheric Measurement and Observation Facility (AMOF) and the FAAM Airborne Laboratory (FAAM), and work with our international colleagues to improve these standards.

- Develop automated chemical mechanism generation methodologies and experimental smog chamber techniques that will underpin the future schemes used in community models of atmospheric chemistry and aerosols.

- Enhance NCAS capability by developing new technology for atmospheric measurements that will support scientific discovery and equip NCAS to meet the challenges of the future including enhanced sustainability.

- Embed the NCAS observational programme as a respected contributor to international networks and infrastructures such as the World Meteorological Organization Global Atmosphere Watch (WMO-GAW), Integrated Carbon Observation System (ICOS), In-service Aircraft for a Global Observing System (IAGOS), Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS), and E-Profile - a network run by European National Meteorological Services (EUMETNET).

Near-term actions

- Implement updated reaction schemes for the atmospheric degradation of volatile organic compounds and improved representation of Criegee intermediates in ozone and aerosol processes.

- Assess the role of co-emitted nitrogen oxides (NOx) in changing the atmospheric formation efficiency of secondary organic aerosols in air and the implications for regional air pollution controls.
- Improve methods of interpreting multifrequency weather radar returns and therefore the ability to better represent cloud processes in weather forecast models.
- Develop new calibration methods for cloud in situ measurements to support campaigns by the FAAM Airborne Laboratory, and contribute expertise and instrument development effort to the Mid-Life Upgrade of FAAM.

Models, Data and Analysis

The science of weather, air pollution and climate involves acquiring, generating, and exploiting vast amounts of data. New and improved observing systems are used to generate data which are used throughout the NCAS science programme, alongside the complex simulation systems necessary for integrating observations, generating understanding, and for delivering understanding about possible futures.

Data volumes and velocity are increasing rapidly. Miniaturisation results in more sensors and higher data rates. Increasing compute supports the simulation of more processes with higher fidelity.

These developments bring challenges in managing and exploiting data and developing new codes which efficiently exploit new forms of computing. Addressing these challenges is crucial to integrating the new advances into

“Digital Twins of the Environment” suitable for exploring interventions in environmental systems and policies across a range of possible futures.

Long-term ambitions

- Ensure that the UK community has the right modelling tools for the available High Performance Computing (HPC) platforms and research programmes. This includes:
    - developing tools for handling data and workflows from very high resolution models and/or large ensembles running at, or near exascale performance.
    - exploring the use of machine learning and artificial intelligence techniques within models and analysis workflows.
    - further developing existing world-class high-resolution climate modelling (HRCM) capabilities for simulating and understanding high impact weather and understanding and projecting long term global change (through the UK Earth System Model - UKESM).
- Develop tools, workflows, and protocols to enhance data services, both to maintain capability in the face of rapidly growing data volumes and to provide users with the benefits of new approaches to data exploitation.
- Establish the fundamental knowledge systems (standards, vocabularies, software systems) and internal expertise necessary to maximise the benefits of investments in observational data, to expand further into multidisciplinary global science, and develop and sustain the necessary networks and partnerships.
- Exploit, sustain and extend existing international collaborations supporting global data exchange, model intercomparison, and computational resource sharing.

Near-term actions

- Extract the existing UK community atmospheric chemistry-aerosol global model (UKCA) from the Unified Model, develop it as a standalone model in a separate repository, and re-integrate it into the Unified Model as a coupled component.
- Work with STFC and the National Oceanography Centre (NOC) to develop fast portable ocean model components for use in the new Met Office LFRic model and other high-resolution coupled model applications.
- Further develop the Earth System Grid Federation architecture and services in support of the sixth and seventh Coupled Model Intercomparison Project

(CMIP6 and CMIP7), including reliable fast replication, data aggregation and extraction, and extensions of the documentation capabilities provided by ES-DOC. Developing mechanisms for improved assessment and reporting on quality of data and metadata.

- Establish new data description mechanisms for future model intercomparison, and enhance support for the Climate Forecast Network Common Data Form (NetCDF) conventions (extend standards and improve software). Contribute to the architecture and capabilities of software libraries used for evaluating the scientific quality of simulation output.
- Configure and optimise existing models and workflows for very high resolution (1-10km atmosphere) global climate applications, to include CF compliant NetCDF output and other data handling technology suitable for efficient execution and management of the outputs of large-ensembles.
- Develop automated systems to better support real-time air quality simulation, data capture, and archival.
- Develop (customise) computing systems which can handle extreme volumes of data in a performance and affordable manner.

Research Themes

Air Pollution

Air pollution is a multi-faceted problem that impacts on people, ecosystems and food production and is the largest cause of global preventable death.

Air pollution impacts are global in reach affecting countries across the full spectrum of development. Whilst air pollution causes harm to all, disproportionately large health impacts are often experienced by the poorest in society. Reducing the effects of air pollution requires knowledge of the emissions of pollutants, their chemical transformations, the dispersion of pollution in the atmosphere and how pollution interacts with both people and ecosystems.

Delivering significant co-benefits from greenhouse gas reduction and net zero policies and air quality management strategies is a key interdisciplinary science and technological challenge.

To advance air pollution science and solutions that deliver health and ecosystem benefits, we need to address the following research challenges:

- Better estimation of air pollution emissions are needed to support local, national and international actions to improve public health, to evaluate the impact of new technologies and policy intervention and to measure progress towards meeting long-term pollution reduction goals.

- Quantifying urban exposure to air pollution is central to predicting health impacts and optimizing the effectiveness of energy decarbonization, urban planning, new transport infrastructure and health service provision.
- Health effects of air pollution include diseases such as asthma, stroke, chronic obstructive pulmonary disease, and cancers. Better knowledge of the composition of pollution is needed for more targeted controls on those chemicals that induce the greatest health effects.
- Air pollution is a trans-boundary issue that requires continued international cooperation to manage, but that may increasingly be impacted by climate change and natural processes such as heat waves, forest fires and dust storms.

Long-term ambitions

- Play a leading role in delivering on NERC's ambitions for a Healthy Environment to "sustain healthy urban and rural environments in the UK and worldwide to benefit people, flora and fauna, by working with partners and experts from other disciplines such as public health and medicine."
- Support and invest in science and infrastructure capabilities that allow for detailed air pollution observations (including multi-year studies), enhance the chemical modelling of air pollution, and support data analysis, to ensure that NCAS retains its leading position as an academic authority on the science of gases and particles in the atmosphere.
- Continue to make world-leading advances in fundamental atmospheric gas and condensed phase chemistry and physics, in areas such as gas kinetics, photochemistry, heterogeneous processes, cloud-particle interactions, atmospheric modelling, instrument development and chemical metrology. Support emerging areas of science and evidence associated with energy transitions, behavioural change and impacts of the built environment.
- Provide leadership in the areas of science and evidence to support air pollution strategies working nationally with Government in areas including air quality standards and regulation, Net Zero design and optimisation, emissions verification, modelling and prediction and the attribution of pollution effects. Shaping global programmes with WMO-GAW, World Health Organization (WHO) and non-governmental organisations (NGOs) such as the United Nations Children's Fund (UNICEF) and the Clean Air Fund.

Near-term actions

- Lead the sector, and play a central role in delivering the Clean Air: Analysis and Solutions programme, a major £40M investment by the UKRI

Strategic Priorities Fund, to improve prediction of air pollution exposure and its impact.

- Enhance laboratory-based research and technology development. We will ensure our national capability is balanced to support a critical mass of basic laboratory science and technology, and build new links to funders of fundamental physics and chemistry.
- Provide time-critical science, by investing staff time and resources into evidence and data synthesis that supports the UK government in the development of the Environment Bill, and subsequent new secondary legislation associated with creating new air pollution standards for the UK.
- Formalise joint research programmes, by collaborating widely across universities, research centres and national agencies. We will continue to play our vital coordinating role with universities and NERC, and create new links with national laboratories such as Public Health England, Medical Research Council and the National Physical Laboratory.
- Undertake multidisciplinary research. Delivering actionable science to improve air quality needs a blend of disciplinary and multidisciplinary research. We will expand our links to biomedical, social sciences and engineering disciplines to support effective solutions, in areas such as electric vehicles, carbon capture and storage, hydrogen fuel, buildings design and consumer products.
- Support international development. We will work to deliver our research and overseas impact objectives that support improved air quality in low and middle income countries.

Climate and High Impact Weather

High impact weather (HIW) events are those that have substantial socio-economic impacts, such as storms, floods, heatwaves and droughts. Assessing and predicting the risks associated with high impact weather is essential, so that society can mitigate impacts and adapt to a changing climate. For example:

- Early warnings of high impact weather, from hours to years ahead, are required to keep people and keep assets, like food and infrastructure, secure.
- Increasing resilience to high impact weather is central to achieving the United Nations Sustainable Development Goals and The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement and to realising the ambitions of the Sendai Framework for Disaster Risk Reduction.
- In the UK, information about high impact weather is essential for Climate Change Risk Assessments, National Adaptation Plans, the Natural Hazards Partnership and the National Risk Register
- A rapidly increasing range of economic sectors have identified the assessment of climate and high impact weather risks as a high priority requirement.

These urgent national and international needs are likely to become even higher priorities for policy makers and businesses over the next decade. Specific priorities for NCAS are: (i) Cyclonic storms (extratropical cyclones and mesocyclones, tropical cyclones and tropical-extratropical transitions) which produce extreme winds, heavy rainfall and coastal flooding; (ii) Convective storms which produce flash

flooding, damaging winds, hail and lightning. These storms occur on scales of 10 km for individual thunderstorms to hundreds of km for mesoscale complexes. (iii) Persistent high impact weather events including cold events, heat waves, droughts and persistent rainfall leading to large-scale flooding. (iv) Large-scale modes of variability such as the NAO (North Atlantic Oscillation), ENSO (El Nino Southern Oscillation) and the MJO (Madden-Julian Oscillation). These modes of variability are one of the primary drivers modulating HIW events and hence risk; they also govern the predictability of HIW on sub-seasonal, seasonal and climate time scales.

Major research questions include: What processes are central to the development, persistence and decay of these phenomena? How predictable are they at lead times from hours to decades? To what extent do large-scale modes of variability modulate HIW? How is climate change affecting HIW and large-scale modes of variability, and how will it do so in future?

In addition to advancing the fundamental science in this area NCAS will work with partners to develop solutions that deliver a productive, healthy and resilient environment.

Long-term ambitions

- Play a leading role in delivering on NERC's ambitions to build a Resilient Environment: "invest in research and innovation that advances understanding of environmental hazards, and the ability to plan, create policy, and manage vulnerability, risk, response and recovery in a changed and changing world."
- Sustain and invest in key capabilities to ensure NCAS retains its leading role in the science of climate and high impact weather, in particular:
    - capabilities in global high resolution modelling and associated data analysis, including taking advantage of new opportunities arising from the advent of exascale computing.
    - new sensor technologies, in-situ observations, remote sensing, and aircraft instruments to enable NCAS to make new progress in understanding key atmospheric processes.
- Continue to make world-leading advances in fundamental atmospheric science underpinning climate and high impact weather, in areas such as cloud physics, atmospheric modelling, predictability of extreme weather events, and climate processes. Also play a leading role in emerging areas of science, such as the attribution of changing risks, new observational techniques, sub-seasonal to decadal forecasting, and exploiting high-resolution models for risk assessment.

- Shape and contribute to new international programmes such as the World Climate Research Programme Lighthouse Activities “Explaining and Predicting Earth System change” and “Digital Earths” and the World Weather Research Programme HiWeather, Polar Prediction and Subseasonal-to-seasonal prediction projects.

- Build partnerships to address the impacts of climate and high impact weather, to enable robust decision making by government, businesses and society, supporting specific needs such as the UK Climate Change Risk Assessments, the Task Force for Climate-Related Financial Disclosures, and international development.

Near-term actions

- Further develop NCAS capabilities in high resolution climate modelling in collaboration with the Met Office and other partners, and advance applications to address fundamental science questions and the quantification of changing HIW risks.

- Complete the NCAS-led North Atlantic Climate System Integrated Study (ACSIS: 2016-2022) on quantifying, explaining and predicting changes on decadal timescales in the North Atlantic climate system, including new research on the impacts of North Atlantic changes on hazardous weather in the UK.

- Play a leading role in new multi-centre NERC programmes to address understanding of high impact weather in a changing climate.

- Further develop NCAS research and impact activities that address the urgent needs of low and middle income countries building on the achievements of the National Capability Atmospheric Hazard in Developing Countries: Risk Assessment and Early Warning (ACREW) programme, the Global Challenges Research Fund African Science for Weather Information and Forecasting Techniques programme (GCRF African SWIFT), and the Newton-funded Weather and Climate Science for Service Partnership (WCSSP) programmes.

- Develop and improve new sensor technologies, in-situ observations, remote sensing, and aircraft instruments to enable NCAS to make new progress in understanding key atmospheric processes and to enhance the environmental sustainability of atmospheric measurements.

- Develop new analysis techniques to assess high impact weather risk by using large ensembles of high-resolution models, pioneering approaches to quantify the impacts of high impact weather, taking advantage of machine learning and big data, and developing new statistical and visualisation methods.

Long Term Global Change

Human activities are today the biggest driver of changes in global climate and atmospheric composition. The ongoing global temperature rise and associated changes in weather and climate are directly impacting - and will continue to impact - livelihoods, societies and economies worldwide, as well as creating serious threats to biodiversity and ecosystems.

In the 2015 Paris Agreement of the UNFCCC, global leaders agreed on an ambitious target to curb global heating, aiming to limit it to a rise of 2°C. There is an urgent need for robust scientific evidence to support the policies and actions required to achieve this mitigation ambition, whilst at the same time adapting to the changes that are already unfolding and amplifying, and improving capacity to anticipate future changes that are as yet poorly understood.

Specific challenges for research include:

- Quantifying, explaining and predicting long-term changes in atmospheric composition in the context of changing climate and air quality. This includes: exploring stratospheric ozone recovery trajectories; assessing the oxidising capacity of the troposphere and effect on ozone and methane; and reducing the large uncertainties about how natural and anthropogenic aerosols affect climate.

- Quantifying, explaining and predicting long-term changes in global climate. This includes: finding tighter constraints on Earth's energy budget; understanding and quantifying the roles of natural (e.g. solar, volcanic) and anthropogenic forcing factors; and understanding the two-way interactions between climate and

composition, including quantifying the ongoing changes in global carbon and other biogeochemical cycles.

- Quantifying, explaining and predicting long-term changes in regional climates. This includes understanding: the dynamics and natural variability of climate on decadal-to-centennial timescales; how patterns of circulation in the atmosphere and ocean are responding to climate change and how they may change in future; and the effect of atmospheric circulation change on regional climates and the water cycle. Priority regions for NCAS are: the North Atlantic and Europe; the Arctic; Africa; and South and East Asia.

- Addressing specific policy priorities, including: quantifying allowable carbon budgets for key policy targets (e.g. limiting global warming to 2°C); assessing potential climate intervention strategies (e.g. land-based strategies); assessing the mitigation potential of non-carbon dioxide (CO_2) Short Lived Climate Forcers (SLCFs) (e.g. methane, aerosols) and potential co-benefits for air quality; investigating the risk of abrupt, potentially irreversible, Earth system change and the opportunities to provide early warning of such changes.

Long-term ambitions

- Advance the science of quantifying, explaining and predicting global change. Maintain and extend our international leadership in understanding long-term changes through observing and modelling atmospheric composition and its interactions with climate.

- Sustain and invest in key capabilities, such as: the UK Earth System model (UKESM) and physical climate model (HadGEM3); long-term observations of atmospheric composition and climate (NCAS observatories, IAGOS); data processing and storage (Computational Modelling Services - CMS, Centre for Environmental Data Analysis - CEDA, and a data intensive supercomputer called JASMIN).

- Build partnerships to understand new aspects of global change and to better meet the needs of decision makers concerned with mitigation of and adaptation to climate change. This will include enhancing collaborations with other NERC Centres, the Met Office, the Department of Business, Energy and Industrial Strategy (BEIS), the Department for Environment, Food and Rural Affairs (DEFRA), and the Committee on Climate Change (CCC). It will also include building new multidisciplinary collaborations to understand the socio-economic dimensions of climate change.

- Contribute to and help to shape major international programmes such as the new World Climate Research Programmes Lighthouse Activities “Explaining and Predicting Earth System Change” and “Safe Landing Climates”.

Contribute to the knowledge synthesis for policy makers e.g. through the Intergovernmental Panel on Climate Change and WMO Ozone Assessments.

Near-term actions

- Complete the NCAS-led North Atlantic Climate System Integrated Study (ACSIS: 2016-2022) on quantifying, explaining and predicting changes on decadal timescales in the North Atlantic climate system, including synthesis of research on the impact of anthropogenic aerosols on North Atlantic climate change.
- Exploit UKESM to quantify allowable carbon budgets for key policy targets, assess ambitious climate mitigation strategies, and quantify the mitigation potential of non-CO_2 SLCFs and the potential co-benefits for regional air quality.
- Use UKESM to investigate the risk of abrupt, potentially irreversible, Earth System changes, and improve understanding of complex Earth System feedbacks with a view on their enhanced representation in future versions of our models.
- Play a major role in the NERC research programme “Reducing the uncertainty in climate sensitivity due to clouds” by using new measurements of cloud microphysics to evaluate models and improve the quantification of cloud feedbacks.
- Exploit and enhance our capabilities for modelling atmospheric composition. Improve the representation of key composition-climate interactions, including stratospheric ozone and water vapour, and tropospheric aerosol and cloud interactions.
- Contribute to the BEIS funded “Climate Services for a Net Zero Resilient World” programme to inform UK government climate policies on climate change.

Research Theme Intersections

Many societal challenges cut across one or more of our research themes. For example, changes in persistent weather patterns, such as blocking, will impact air quality. Similarly, the technological approaches adopted to deliver a zero carbon economy will also impact atmospheric composition and air quality with a variety of further, and as yet unexplored, consequences.

A key atmospheric science challenge for the future is to understand with more certainty how specific adaptations to climate change, or actions to improve air

quality may impact on addressing existing inequalities and inequities in impact on specific populations.

To address such challenges effectively we must build collaborations across different areas of expertise within NCAS and also with other disciplines spanning the breadth of UK Research and Innovation. We will seek to develop these collaborations with a focus on the impact of our science - targeting the key knowledge gaps that are most important for informing policy and decision making to protect people and the environment.

Management, Monitoring and Evaluation

The NCAS Board owns ultimate responsibility for the management, monitoring and evaluation of the science and innovation programme, supported with input and advice from NCAS Theme Leaders, the Heads of Facilities and other key disciplinary experts in NCAS.

The management of our science programme will be agile and responsive to changing needs and opportunities and will be structured to allow change and adaptation to our research goals and the redeployment of resources and capability when needed. The development of stretching research objectives in each area will be guided both by academic inputs and through regular dialogue with key external stakeholders. The programme leads will report on progress towards short and medium term goals to the Board, and to NERC, and will strive to create a streamlined process of reporting and monitoring that avoids duplication of effort, and that provides helpful and actionable feedback.

We will use a mixture of internal and external expertise for the evaluation of research and innovation outcomes, drawing on the NCAS Science Strategy Board, our external advisory group, and advice received from external processes such as the NERC Centre evaluation.

Work With Us

Over the next five years, we will work with our partners to help society rise to the challenges ahead. To discuss the implementation of our strategy or how you might be involved, contact us.

National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL