



Natural
Environment
Research Council

Strategic Delivery Plan

2022–2025



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Strategic Delivery Plan 2022–2025

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Foreword

We are at a pivotal moment for our environment. Human activity is degrading habitats and disrupting ecosystems around the globe, pushing species to extinction at a pace and scale unprecedented in human history. Climate change is accelerating, and we see its effects in extreme temperatures, droughts, fires, and floods. These become more frequent, and more intense, as global temperatures rise. Reducing greenhouse gas emissions while preparing ourselves for the effects of a changed climate is a fundamental challenge facing our society in the coming decade. We must adapt the ways we grow our food, build our homes and organise our businesses, and make investments as individuals, as businesses and as a nation. Unless we arrest and reverse the damage to our climate and ecosystems, there will be an ever-growing impact on our food supply, economy, and health.

The UK recognises the need for action. Through the legislative commitment to reaching Net Zero by 2050 and the Glasgow Breakthrough Goals agreed at COP26, it has set a path to mitigating climate change for the UK and the world. Achieving these goals requires reform and transformation in almost every part

of the economy: transport, manufacturing, energy, chemicals, healthcare, agriculture and finance. There will be difficult choices in the balancing of finite natural resources, not least the land itself, both between competing needs and in protecting nature. The government has set out strategies to support specific sectors of our economy in the transition to Net Zero. More recently, in the [Energy Security Strategy](#) and the [Innovation Strategy](#), it has set out its vision for a UK which prospers by developing the clean, green technologies and services needed in this country and around the world.

We launch this plan for NERC at an exciting time for research and innovation in the UK. UKRI's first collective strategy, [Transforming Tomorrow Together](#), sets out a vision of a more agile and connected research and innovation system. At the heart of this strategy is the flow of people and ideas across sectors and disciplines. This connectivity is the basis of world-class research and innovation which addresses the pressing problems identified in UKRI's Strategic Themes. Taking advantage of these opportunities to cross-fertilise ideas, technologies, and approaches, NERC will act as a generous partner in designing and joining large-scale, challenge-focused programmes, embedding environmental science in multidisciplinary working to deliver against UKRI, government, National Science and Technology Council (NSTC) and other mission-led priorities.

Our world faces significant challenges; if addressed in the right way, we can collectively overcome them to deliver a more prosperous, secure, and healthy future. To do so will require the creativity and insight of researchers and innovators in every discipline, and in every part of the UK. I am confident our community can play a leading part. This Strategic Delivery Plan sets out how we will catalyse their contribution, working with government, civil society and business. I look forward to what we will achieve together.

Professor Sir Duncan Wingham
Executive Chair, NERC

September 2022



We must adapt the ways we grow our food, build our homes and organise our businesses, and make investments as individuals, as businesses and as a nation.



What we will achieve

Environmental issues dominate global risk registers. Threats to our environment, and environmental impacts on our health and way of life, are growing in severity and immediacy. NERC has a proud history of funding the diagnosis of the state of the environment and our effects upon it, from the discovery of the ozone hole, the source and effects of acid rain, the impacts of carbon, sulphur and nitrogen pollution, and the growing risks from the release of microplastics to our oceans and soils. Environmental science unravels the complexity and evolution of the natural environment and the animals and plants within it; and, with ever more urgency, their interruption, disruption or depletion that result from our activity.

Our diagnoses of the state of the environment give focus and urgency to interventions with which to make good our impact on the environment, to benefit from doing so, and provide a baseline by which we can measure our success. But to move from environmental diagnosis to environmental cure is not something that NERC and its community can do alone.

Addressing environmental cure requires us at the least to pool technical advances, economic and regulatory approaches and understanding of consumer tolerance and preparedness to change. The complexity of our economic and social systems means that cures can only be achieved with coordinated, collaborative approaches which span the whole portfolio of UKRI, and engage more widely with government, business and the consumer, in the national and global contexts.

This Strategic Delivery Plan sets out NERC's core role in assessing the health of the environment. To discover and diagnose emerging issues, we must ensure the UK has the fullest possible understanding of the atmosphere, oceans, and the environments in which we live and work.

The growing impact of human activities on our environment makes this role more important than ever. To do this, we will fund ambitious and adventurous research and innovation, and we will provide the training, skills, and infrastructure the UK needs to remain at the forefront of environmental science.

In addition, the plan lays out how we will bring environmental science to bear within UKRI's portfolio, to find solutions to protect and restore the environment and for humans to live sustainably. The collaborative, cross-disciplinary environment that is UKRI provides the skills, people and solutions that this great challenge demands, equipping the UK with the tools for a green economy in which to base its future prosperity. There is much for us to do.

Our purpose

NERC funds ambitious and adventurous research and innovation, and provides the training, skills, and infrastructure the UK needs to remain at the forefront of environmental science.

Our principles for change – we will embed the principles of diversity, resilience, connectivity and engagement across all our work, to drive change and create the conditions for an outstanding research and innovation system

Our strategic objectives provide the framework for how we will achieve our vision and realise our principles, through world-class:

People and careers	Places	Ideas	Innovation	Impacts
<ul style="list-style-type: none"> • Balancing our funding to attract and retain global scientific leadership; and building communities of solutions-focused researchers. • Collaborating across UKRI to develop a collective approach to talent that nurtures disciplinary and interdisciplinary working. • Developing a deep understanding of our communities and using their insights to evolve our portfolio and to shape new funding practice. • Working with our community to promote greater diversity and inclusion across environmental science. 	<ul style="list-style-type: none"> • Embedding an approach to place-based funding at local and regional level. • Creating and upgrading environmental infrastructures that unlock innovation and economic potential. • Maximising our investment within the UK through partnerships which allow research communities to work together at scale and develop clusters of expertise and investment. • Supporting UK environmental scientists to work with local communities internationally. 	<ul style="list-style-type: none"> • Focusing our discovery science portfolio on excellent, ambitious and high-risk science; working in partnership across UKRI to develop a collective, interdisciplinary discovery science programme. • Pursuing strategic programmes that address the critical environmental challenges of climate change, biodiversity and habitat loss, and pollution. • Co-creating scientific exploration of large-scale, complex interactions within the Earth system. • Increasing our investment in public engagement with environmental science. 	<ul style="list-style-type: none"> • Building the resilience of businesses, infrastructure and supply chains to environmental impacts and changing consumer opinion. • Pursuing positive outcomes for business and the environment that minimise the environmental impacts of consumption. • Realising the potential of sensing and monitoring technologies, artificial intelligence and digital twinning, autonomous and remote sensing, and high-performance computing to create new information services. • Creating the world's first national system to measure the UK's total greenhouse gas emissions. 	<ul style="list-style-type: none"> • Embedding environmental science within UKRI's Strategic Themes. • Sustaining the UK's sovereign capability to advise and inform UK Government policy on the state of UK and global environment. • Determining the effectiveness and accelerating the adoption of nature-based solutions. • Maintaining the UK's position as a leading nation in international environmental science.

Supported by a world-class organisation:

- Acting as one UKRI, as part of the new operating model, stripping out bureaucracy and becoming more efficient to deliver NERC and shared priorities.
- Ensuring NERC commissioning is informed by high quality, diverse scientific expertise and advice.
- Demonstrating the ongoing impact of NERC funding.
- Becoming environmentally sound across our head-office and institute operations while enhancing scientific productivity.



Objective 1: World-class people and careers

NERC has a critical role to ensure the UK has the capability to sustain world-leading environmental science. We support researchers to develop their ideas and their careers, whether leading a project for the first time, building an international team to tackle a significant challenge, or providing research leadership which shapes the future of our science. Alongside researchers, we support the training and career paths for the technicians and specialists who make our research and facilities operable. We build skills and address knowledge gaps through our training provision and our investments in targeted research topics, Research Centres, and infrastructure. In this way, we develop the breadth of skilled people and teams necessary for research and operations in areas of need such as forestry and land management, aquaculture, and environmental governance.

Environmental science is becoming ever more complex and interconnected. NERC must nurture teams and partnerships that can effectively bring a range of expertise to bear on multifaceted challenges. These teams will need to have a mixture of professional and technical skills, including domain experts, modelling and data science skills. They will also be interdisciplinary, working to enable the cross-fertilisation and translation of ideas across environmental sciences and at

the border with biology, engineering, socioeconomics and policy. Building effective teams will require us to encourage diversity; attracting the best talent, from any background or anywhere in the world, so that our science includes and benefits from the widest range of viewpoints and experiences.

Through our doctoral training and fellowships, we provide long-term support to promising researchers to advance their pioneering, curiosity-driven research. We ensure these talented scientists can build understanding of the environment, develop their scientific leadership, and help to find solutions to the pressing challenges we face. The flow of knowledge between researchers and users generates social, environmental, and economic benefits across the UK and internationally, and we will work across UKRI to develop a talent offer to deliver this.

We must also innovate in our delivery, ensuring we support researchers and innovators to fulfill their ideas without burdensome processes. By improving how we award our grants, we will ensure we are funding the best science while reducing bureaucracy for our applicants and reviewers.

We will:

- balance our funding across strategic research and innovation, discovery science, talent and skills and national capability to attract and retain global scientific leadership; and build communities of solution-focused researchers who combine environmental science with other research and innovation disciplines to tackle urgent environmental challenges.

Changing the environment

NERC is supporting large-scale interdisciplinary research which connects economics, engineering, and the environmental, social, and natural sciences. In recent years the scale, complexity and inter-connectedness of environmental, social and economic challenges has increased, threatening livelihoods and environments in the UK and around the world. The Changing the Environment programme will bring together a range of disciplines to drive innovative environmental solutions to these challenges.

We are investing £40 million to develop four centres of excellence across the UK to tackle key issues: biodiversity loss; achieving net zero cities, helping rural communities adapt to climate change; and providing timely data, analysis and evidence for policy decisions.

- collaborate across UKRI to develop a collective approach to talent that nurtures disciplinary and interdisciplinary working and creates skilled personnel to meet the needs of the public, private, and third sectors.
- develop a deep understanding of, and on-going consultation with, our environmental science and wider communities and use these insights to evolve our portfolio and to shape new funding practice to support connectivity, diversity and efficiency.

Transdisciplinary training to manage the UK's marine resources

Working with partners including the Department for Environment, Food and Rural Affairs (Defra), Marine Scotland Science, and the Welsh Government, NERC has invested £2.2 million in a Centre for Doctoral Training to train a cohort of 48 students in sustainable management of the UK's marine resources. Six host universities, alongside 45 associate partners from a range of sectors, will equip students with the skills to think across disciplinary boundaries and develop solutions to the challenges faced by coastal environments, ensuring that graduating students will be highly employable experts, able to develop careers in research, industry and policy to manage the UK's coasts, seas and coastal communities.

- work with leading environmental science focused HEIs and our wider community to promote greater diversity and inclusion across environmental science; work with our doctoral training partners to ensure recruitment is fair; and publish data to show that we proactively monitor our funding processes to ensure fairness and diversity.

Objective 2: World-class places



Environmental science is rooted in places, regions, and communities across the UK and around the world. Internationally, NERC funded science addresses global systems and processes, often covering physical space at continental or oceanic scales. We work with our partner funders to coordinate investment over decades, for example in instrumentation to record the circulation of the Atlantic Ocean, observing Earth systems from space, or assessing ice loss and risks in the polar regions.

Our global science is underpinned by high-quality facilities and infrastructure provided by NERC and its Research Centres to reach, observe, model, and simulate our environment. Ongoing investment in Research Centres, infrastructure, and clusters of excellence ensures that the UK remains at the forefront of environmental science and an international partner of choice.

Our researchers work with other experts, such as engineers, economists, and innovators to bring environmental solutions to where they are needed, including working with industries such as aquaculture, renewable energy, insurance, and utilities which bring benefits to local economies. From helping farmers to boost their productivity while enhancing biodiversity to mapping flood risks, our research provides the basis for effective management of the varied landscapes of the United Kingdom. NERC funding reflects the diversity across the nations and regions of the UK, with more than 70% of our funding being spent outside London and the greater south-east. There are significant opportunities for places across the UK to benefit from their environments, and, with the UK now outside the EU, it can act as one and as a group of connected nations to take a renewed approach to responsible stewardship of its natural resources.

Our investments promote place-based research, delivering impact for all parts of the UK through our engagement with the devolved administrations as well as in England, such as developing flood responses in the North East of England, or a citywide project to boost climate resilience in Glasgow. In addition, our investments develop clusters of regional capacity across the UK, contributing to local economic growth and job creation. For instance, for atmospheric science across the north of England with the National

Centre for Atmospheric Science and the universities of Manchester, Leeds and York; in ocean science, via a range of collaborative approaches, across the National Oceanography Centre, Plymouth Marine Laboratory and universities such as Southampton, Liverpool and Plymouth; and supporting Space Park Leicester through the National Centre for Earth Observation. In this way we spread prosperity, levelling up the UK economy and unlocking environmentally sustainable investment, including in key sectors such as energy and space.

Through our Research Centres we deliver national capabilities for the UK in critical and sensitive areas of environmental science, such as geological and atmospheric records, marine resources, and the UK's scientific presence in Antarctica. Long-term investment in these Centres enables decadal scale science and the management of the long-term and large-scale datasets – such as the Biological Records Centre at the UK Centre for Ecology and Hydrology (UKCEH) and the Permanent Service for Mean Sea Level at the National Oceanography Centre (NOC) – which support the work of the international scientific community and related industries.

We maintain a strong partnership with the Meteorological Office, with shared interests in computationally intensive research, modelling and data. The expertise and infrastructure we

CO₂ storage research facility

Carbon capture and storage could ease the transition to net zero, especially for high emission industries. To improve the technology and ease the pathway to private investment, the British Geological Survey (BGS) and NERC are scoping a new CO₂ storage laboratory for the UK. This innovation platform will develop new techniques and equipment to improve monitoring, reduce costs, and further enhance safe storage.

jointly support provides the foundation for the UK's strength in climate and atmospheric science and drives investment in Exeter and the south west. Through collaborative research programmes and the expertise of our Research Centres in data and modelling, we will work together to build the interdisciplinary partnerships needed for climate advice relevant to national and local governments and businesses across the UK.

We will:

- embed an approach to place-based funding across environmental science which provides benefits at local and regional level as well as the UK more broadly, and ensure we build and demonstrate the impacts of these investments over time.
- create and upgrade environmental infrastructures that unlock innovation and economic potential, benefit local businesses and communities, and target national priorities across the UK, such as a £38 million investment to create a national floods and droughts research infrastructure by 2028–29, and £3 million to scope a CO₂ Storage Research Facility.
- maximise our investment within the UK through partnerships to allow research communities to work together at scale and develop clusters of excellence and investment, leveraging infrastructure and expertise right across UKRI and with external funders.
- support UK environmental scientists to work with local communities internationally to embed science that responds to adaption to climate change, maintains biodiversity, and supports sustainable development and innovation, and strengthens resilience to responses to environmental emergencies.

Case studies**Regional Impact from Science of the Environment (RISE)**

The RISE partnerships, delivered by NERC, enable research organisations to develop ambitious, long-lasting and inclusive partnerships that maximise the contribution of research and innovation to local growth and opportunity. Four programmes worth a total of £17 million are currently active and have successfully levered new investment:

- Yorkshire Integrated Catchment Solutions Programme has engaged 239 partner organisations and has helped to secure £14 million of additional investment in the Yorkshire region.
- South West Partnership for Environment and Economic Prosperity has 191 partners including businesses, public sector bodies, charities and community groups, has helped to secure £48 million of extra investment for the South West region.
- Clean Air Science for the West Midlands has helped to secure £16 million of regional investment and engage over 70 organisations.
- Community Water Management for a Liveable London has reached over 80 organisations and helped secure over £2 million of additional investment.



Objective 3: World-class ideas

The UK leads the world on research quality in environmental science. The research that NERC funds, whether driven by curiosity or specific challenges, creates breakthroughs in understanding for both the environment and human interactions with it. As the planet continues to change, revealing new insights through original inquiry remains central to our purpose.

Our investment in ideas spans the full breadth of the sciences and methodologies required to advance our understanding of the Earth system and to reveal the impact of people on environmental processes that have evolved over thousands or millions of years. Driven by researchers' curiosity and imagination, this science enables individual discoveries and unlocks the cumulative benefits of revealing new knowledge over time. We will balance our portfolio of investments to ensure that we support the long-term health and resilience of a diverse and dynamic R&I system, supporting the people who generate the ideas and innovation that are at the core of this system.

The advances and lasting benefits that discovery science delivers drive policy change and catalyse innovation in the UK and worldwide. To better support ground-breaking ideas, we are transforming our Discovery Science portfolio, with increased investment and support to empower adventure and ambition.

This includes increasing the flexibility of our grants, allowing our researchers to exploit new technologies and approaches more dynamically.

Digital approaches will be at the heart of NERC's drive to deliver world-class environmental science. Advances in computational power and advanced simulations (such as digital twinning) will further enhance our ability to model the environment. Through improvements in sensing technology combined with artificial intelligence (AI) and machine learning we can provide environmental data in greater detail than ever before, and develop the tools needed to analyse high volumes of information. Through [NERC's Digital Strategy](#) we will develop a digital ecosystem approach, improving the connectivity between environmental data and analysis to deliver a step-change in environmental modelling, prediction, and decision-making.

We, with the community we fund, understand the scope and scale of many of the Earth's most significant challenges, but solutions to issues such as biodiversity collapse can only be addressed by pooling expertise and capability. Working in partnership across UKRI, we will develop the multi- and interdisciplinary programmes necessary to tackle these fundamental societal challenges, for example working with the Biotechnology and Biological Sciences Research Council (BBSRC) to ensure food supplies without adverse impacts on our environment; with the Engineering and Physical Sciences Research Council (EPSRC) and the Medical Research Council (MRC) to remediate pollution and provide a healthy environment; and with the Economic and Social Research

Exploring the Frontiers

Our Exploring the Frontiers pilot in 2022 will encourage researchers to exploit new technologies and approaches in a more dynamic way. We will streamline the application process and increase the flexibility of awards, supporting exploration of original and exciting areas of environmental science.

Council (ESRC) and Innovate UK to improve the sustainability and resilience of economic systems.

Many of these pressing issues exist at a global scale, but also have localised effects, which our research helps to identify, solve, and translate to other contexts. We will continue to support our researchers to share their knowledge and understanding of our global environment, in the UK and internationally, to tackle these transboundary environmental issues.

We will:

- increase our discovery science portfolio to £64 million by 2024–25 and focus on excellent, ambitious and high-risk science, by reducing applications to focus on the scientific reward, and increasing the scope and flexibility of our grants; working in partnership across UKRI to pilot a new cross-UKRI fully open

Growing biodiverse agriculture

In the coming decades we will need to produce greater quantities of food, yet agriculture can have significant environmental consequences, either locally or as part of a wider landscape. NERC, in partnership with BBSRC, is investing £6 million in Molecules to Landscapes, supporting whole-systems research to identify practices which can help move the agricultural system to becoming a net provider of both agricultural and ecological services.

interdisciplinary responsive mode programme (pan-UKRI investment of £65 million) that will support new and emerging areas that reach beyond disciplinary boundaries, building new collaborative partnerships.

- pursue strategic programmes that address the critical environmental challenges of climate change, biodiversity and habitat loss, and pollution; and work in partnership with other research councils, funders and government to ensure a productive, resilient, and healthy environment.
- co-create scientific exploration of large-scale, complex interactions within the Earth system through combining the expertise and capability of the NERC-funded institutes and those of the Meteorological Office and other UK public sector research establishments (PSREs), to pursue, for example, regional-scale climate variability

in the Arctic-North-Atlantic climate system and understanding how sea-ice loss and glacial melting in polar regions affect the chemical balance of the oceans.

- increase our investment in public engagement with environmental science to £0.7 million by 2023–24, to ensure we are listening to ideas from the UK public to inform NERC and future environmental science.



Improved understanding of volcanic systems

For over a century, the theoretical model of the magma chamber – a single large body of liquid found in the Earth's shallow upper crust – underpinned our understanding of volcanic processes. However, these magma chambers had never been found. In the 1980s, NERC-funded researchers challenged this model and explained in a new way how hot magma and crust interact. This early investigation opened a new field of work that continues to be central to NERC research today.

Over the subsequent thirty years, a wave of curiosity-driven research has developed and evidenced an alternative theory to the magma chamber – a trans-crustal system of crystalline mush – which has deepened our understanding of volcanic systems. Now widely accepted, the concept of “mush” has transformed how we understand many igneous processes. This builds our understanding of how volcanoes behave and improves models used for prediction.

Transforming Atlantic Ocean monitoring

A revolution in understanding the behaviour of North Atlantic deep ocean currents, made possible by international partnership initiated

Case studies

by NERC, has improved the accuracy of UK weather forecasts and climate predictions. The Atlantic circulation plays a critical role in the global climate system and has a substantial impact on weather and climate in the UK. By developing the first ever permanent ocean observation system of deep currents spanning the North Atlantic, the partnership addressed one of the key unknowns in climate science.

NERC approached the United States of America's National Science Foundation (NSF) in 2002 with a proposal to collaborate. The agencies agreed to work together to establish the RAPID instrument array, to replace occasional measurements made by research ships with a continuous monitoring regime undertaken between the east coast of North America and the northwest coast of Africa. Delivering a step change in the amount of data collected, this ambitious, visionary solution was further strengthened when the USA's National Oceanic and Atmospheric Administration (NOAA) joined the partnership.

In 2014, building on this success, NERC and NSF worked closely to deliver a second array, OSNAP, spanning the ocean between Canada, Greenland and Scotland. Data from RAPID and OSNAP has improved weather and climate models harnessed by the Meteorological Office and has also been used in the influential reports produced by the Intergovernmental Panel on Climate Change (IPCC).

Objective 4: World-class innovation

As our environment changes so does the context in which business thrives and innovates. Consumers are more aware than ever of the environmental impacts of their consumption, and the UK's policy environment is gearing towards a low-carbon, green economy, opening up new sectors and developing the economic impact of existing sectors across the UK. Business will benefit from understanding the risks and opportunities of environmental and social change as they transition to sustainable business models. Different sectors will have specific research needs as they go through this transition; NERC, working across UKRI, will broker connections between industry, investors and the researchers and innovators who can translate their ambition into the solutions businesses need, thereby diffusing effective interventions across the economy.

Environmental science helps business to assess and manage the environmental sustainability of supply chains, manufacturing, logistics, and operations. For businesses of all sizes, NERC science supports cost-effective approaches to monitoring and improving their environmental sustainability.

We will work closely with industries who directly rely on the environment such as utilities and agriculture, unlocking private sector investment in R&D to enhance productivity and to secure the resources they need in an environmentally responsible way.

The links between climate, the environment, and humans means sustainability goes beyond the greenhouse gases driving climate change. Every step in a value chain has environmental impact, for example on biodiversity, land-systems choices, and pollutants in the air, soils and water. We will develop cost-effective ways to measure impact across the whole set of activities including resource extraction and energy production, transportation, manufacturing, and waste, as well as related professional and maintenance services. We will build on our partnerships across UKRI and with industry to ensure we bring environmental science together with innovation to tackle key societal challenges, for instance developing a new programme, investing at least £10 million with the Arts and Humanities Research Council and Innovate UK, to transition fashion and textiles supply chains to economically and environmentally sustainable models. We will provide the insights needed to combine economic growth with sound environmental practices across whole systems of business activity.

The environments in which our science takes place drive technological innovation and demand sophisticated use of data and digitisation. Whether exploring hazardous or unreachable locations through robotics, or undertaking large-scale

monitoring through novel sensors, our scientists and our Research Centres have built expertise in developing and deploying new technology and leveraging data for innovation. We will build on this capability and encourage partnerships, knowledge exchange and technology transfer to support industry; for example, using autonomous and remotely operated equipment to maintain offshore wind turbines, or using technological advances in communications and mobile infrastructure to gather near-real-time environmental data.

We will:

- build the resilience of businesses, infrastructure and supply chains to environmental impacts and changing consumer opinion by integrating environmental data and modelling into business and finance decision-making and investment choices. Work with senior business leaders to co-create targeted programmes to mitigate environmental challenges and pursue environmental opportunities.
- pursue positive outcomes for business and the environment that minimise the environmental impacts of consumption, including but not at all limited to, on- and off- shore wind energy, marine and rare earth mining, plastic waste handling and disposal, clothing production, agriculture and aquaculture, sub-ground geo-thermal energy and carbon storage, and the hydrogen economy.

Greening Finance

The UK Centre for Greening Finance and Investment (UKCGFI) brings together interdisciplinary expertise to support the shift to environmentally sustainable economic activity. NERC and Innovate UK have invested £10 million in the centre to help ensure that the financial services sector has the access to, and understanding of, the data it needs to properly price climate and environmental risk.

- realise the potential of sensing and monitoring technologies, artificial intelligence and digital twinning, autonomous and remote sensing, and high-performance computing to create new information services for research, government and businesses.
- create the world's first national system to measure the UK's total greenhouse gas emissions through the combination of ground- and space-based measurement and data assimilating, advection models, investing in partnership at least £4 million to bring together the capabilities of the National Physical Laboratory (NPL), Meteorological Office and NERC-funded laboratories.

Case studies



The Cool Farm Tool

In 2010, researchers at Aberdeen University worked together with the non-profit organisation Sustainable Food Lab in Vermont, and the consumer goods company Unilever to launch the Cool Farm Tool – an online greenhouse gas calculator that farmers can use to work out the environmental impact of their practices. The idea behind the tool is that farmers, suppliers, and others working in the food industry can take steps to reduce their carbon footprint, while at the same time maintaining or even boosting yield and productivity.

Since then, the project has grown and become more ambitious, as more businesses such as PepsiCo, Heineken, Danone, Tesco, Heinz, Mars, and McCain have got involved. Now the tool, run by the not-for-profit organisation Cool Farm Alliance, has helped tens of thousands of farmers in more than 118 countries around the world assess their carbon output and take steps to reduce it.

Objective 5: World-class impacts

NERC science helps government, business and society work together to address national and international priority areas from nature to security. Foremost among these shared challenges are the impacts of climate change and pollution, and the need to secure food and raw materials in ways which cause minimal damage to the environment.

The UK's ambition to reach Net Zero by 2050 relies on decarbonising our energy supply. Our understanding of the environment can help the UK seize opportunities in renewable energy, such as unlocking geothermal energy from mine shafts or enabling the expansion of wind power across the country. NERC science assesses the potential environmental impact of new technologies and climate interventions, from novel energy vectors to geoengineering. In doing so, our investments contribute to the UK's transition to Net Zero by 2050 and support the principle of informed precautionary regulation and the 'energy and environment' ambitions set out in the [Government's UK Innovation Strategy](#).

The expertise of our research community ensures robust, evidence-led policymaking relating to the environment. By diagnosing harm to the environment and human health, our science informs policymakers and the public of the need for change and guides effective interventions. We provide the insight and predictive power for the public and private sectors to understand and mitigate environmental risks globally. Our work underpins management of natural capital and the protection and restoration of biodiversity in the face of human activity. In partnerships which include engineers, social scientists, biologists, and economists, among others, NERC working across UKRI can help society to adapt our lives and livelihoods to a changing climate both in the UK and across the globe.

Our science is key to the UK's management of its natural resources, including the reform of farming subsidies to replace the EU Common Agricultural Policy. The insights of our community support the roll-out of the [Agriculture Act 2020](#) and help to protect and enhance nature through the [Government's 25-year Environment Plan](#) in England and equivalent strategies in Scotland, Wales, and Northern Ireland. This includes work to track industrial pollutants and minimise their impacts; increasing the sustainability of key industries including energy, resource extraction, and fisheries and marine resources; and helping the UK manage its land productively while delivering a net gain for the environment.

NERC provides a sovereign capability, ensuring independent, credible science for the UK and providing the British presence in the Arctic and Antarctic through the British Antarctic Survey (BAS). Our unique delivery bodies such as the British Geological Survey (BGS) and the UK Centre for Ecology and Hydrology (UKCEH) store critical data on the UK's environment and enable science at scales and scopes which would not otherwise be feasible. The research communities they support address questions of national importance, such as the impact of chemicals on our biodiversity and food systems, or the UK's supply of minerals such as cobalt and lithium necessary for clean technologies.

[Transforming Tomorrow Together](#), UKRI's collective strategy, sets out five Strategic Themes, including Building a Green Future, Tackling Infections, and Building a Secure and Resilient World. These are global challenges which require collaboration across all parts of the research and innovation system. Many of these challenges will involve environmental scientists, and they will all need to be addressed in the context of the adaptation and resilience needed

Wastewater early warning for COVID-19

An ingenious early warning system was developed at express speed thanks to NERC's fast-track funding to build on an existing environmental microbiology programme. The breakthrough was the recognition that coronavirus fragments in wastewater can reveal when and where the virus is circulating, even if those infected are not exhibiting symptoms. Rolled out from June 2020, it has been used by NHS Test and Trace to spot where new outbreaks may be happening.

NERC working across UKRI can help society to adapt our lives and livelihoods to a changing climate both in the UK and across the globe.

for a changed environment. Our understanding of the environment, of linked hazards, and the ability to model both a changing world and the impacts of interventions will be fundamental to developing these Themes.

We will:

- embed environmental science within UKRI's Strategic Themes (pan-UKRI investment of £185 million) to provide low-emission, environmentally sustainable solutions in land use, energy and transport; build national resilience to infection and climate change; and ensure an environmental component to human well-being.
- sustain the UK's sovereign capability to advise and inform UK Government policy on the state of UK and global environment concerning matters as diverse as, but by no means limited to: the provision of critical minerals and likely impacts of fracking for gas in the UK; sea-level rise; the maintenance and effect of UK marine protected areas; and the impact of pesticides on economically important pollinators.
- determine the effectiveness and accelerate the adoption of nature-based solutions to the UK's energy requirements, resilience to environmental extremes and risks, and maintaining our biodiversity and natural habitats and environment.
- maintain the UK's position as a leading nation in international environmental science through the modernisation of the NERC blue water and polar marine fleets, a £290 million investment over the next 10 years in the UK's Antarctic and Arctic bases and intercontinental logistics, a £49 million mid-life upgrade of our leading-edge atmospheric research aircraft by 2025–26, and the provision of data and informatics. Use these capabilities in support of UK science diplomacy, contributing to international partnerships designed to better understand and manage the global terrestrial, sub-surface, ocean and polar environments and biodiversity..



Case studies

Protecting global data flows

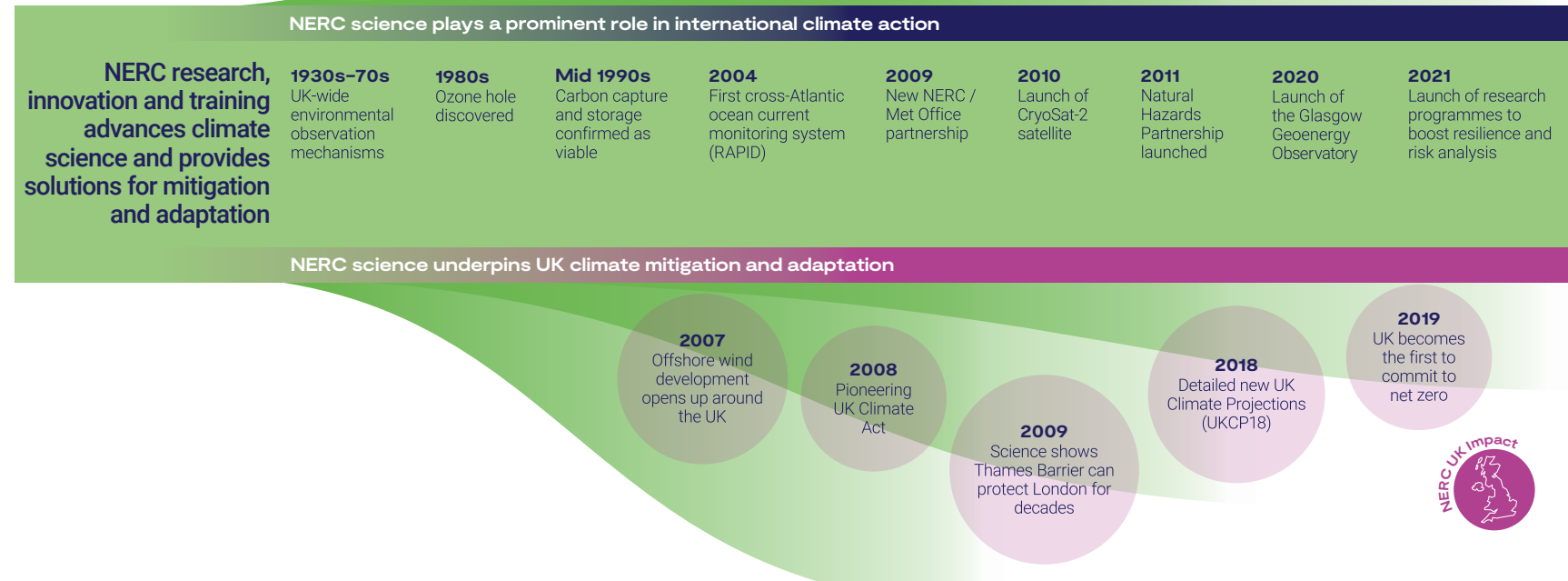
Global internet, financial and cloud data storage services are now more reliable thanks to NERC-funded research into threats to seafloor telecommunications cables. In a world first, scientists identified a link between river flooding, underwater sediment flows, and breakages of deep-sea fibre-optic cables, prompting new measures to reduce future breakage risks. As undersea cables carry over 95% of the world's data traffic, fewer breakages mean less disruption to vital telecommunication networks and protects cable companies from reputational damage and hundreds of millions of pounds in cable repairs.

Seafloor sensors placed by the NERC project team at the mouth of the River Congo provided the first ever measurements of a huge, cable-breaking underwater avalanche of sediment early in 2020. Based on this data, leading cable companies are re-routing planned new cables and investing in longer routes to avoid potentially hazardous areas of seabed. Cable companies and scientists are also exploring how sensors could provide advanced warning of cable-breaking sediment flows to ensure vessels are on hand to make quicker repairs, and how future changes in climate and flood frequency may impact seabed cables.

NERC climate science to solutions

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

Case studies



Contributing to the many UN Sustainable Development Goals including:



Putting the UK at the forefront of global policy to confront climate change

The Intergovernmental Panel on Climate Change (IPCC) provides regular assessments on climate change, future risks, and options for addressing climate change. The reports are the cornerstone for international climate change negotiations and they prompt government and business action across the world. NERC's long-term support for earth observation, research, innovation, and training has delivered advances in climate

science that have been central to every IPCC report to date. Over the last 20 years, dozens of NERC-supported scientists have been entrusted with vital roles – from contributing lead author to expert reviewer – in producing IPCC's flagship Assessment Reports.

For example, 87% of the UK-based authors of the physical science section of the latest,

Sixth Assessment Report, are NERC-funded. By establishing an international consensus based on the latest science, the IPCC's reports have been the cornerstone for international climate change negotiations, and action by businesses and governments around the world.



Objective 6: A world-class organisation

NERC's role and remit within UKRI is to sustain world-class environmental science. To deliver this, we work actively across and with all parts of UKRI to ensure together we are an outstanding organisation for research and innovation in the round, as well as ensuring the health of environmental science in the UK. Over the next three years we will become less bureaucratic, more outcomes-focused, more innovative, more sustainable, and more diverse and inclusive. We will do this working as one UKRI, delivering our shared ambitions within our targets for operational expenditure.

We will reduce the burdens on applicants for our funding, only collecting necessary and proportionate information to enable sound, effective and accountable decisions. We will re-design our internal processes to be as efficient and effective as possible, joining up across UKRI to realise benefits through harmonised approaches to reduce duplication and ensure maximum value for money. This includes delivery of a single funding service, through the Simpler, Better Funding programme and a new Enterprise Resource Management system through the SHARP programme, as well as responding

to the relevant Grant Review and Tickell Review recommendations through the UKRI Reforming our Business and Operating Model organisational change programmes. We will live by our principles for change and be an open and generous partner, collaborating within and outside UKRI as a lean, responsive organisation.

Our staff are key to commissioning the programmes, infrastructure and facilities that support researchers, innovators, business, government, and international stakeholders. This requires investment in our people and their skills, alongside insight and engagement to fulfil our core role to convene and catalyse, and expertise to demonstrate the social, economic, and cultural impact and outcomes of our funding.

Maintaining our scientific capability and supporting world class facilities, infrastructure, and research for UK environmental science, we will target key interventions to ensure we reach net zero across NERC operations by 2040, in support of UKRI's 'net zero' target. For instance, the modernisation of our Antarctic infrastructure and the transition of our oceanographic capability to Net Zero must support excellence in polar and marine science while also being state-of-the-art in terms of environmental sustainability and operational efficiency. Our long-term aim is more investment in science, rather than on fuel and logistics.

Over the coming three years we will increase our deep understanding of our community and develop our insight into the emerging areas of strength in UK environmental science. NERC Council will continue

to play a critical role providing advice on strategic priorities and budgets, supported by the Science Committee, the Peer Review College, and the NERC Advisory Network, a flexible pool of retained expertise that advise NERC as needed. We will also continue to engage through increased use of secondments to bring in scientific expertise, as well as developing our insight into the emerging areas of strength in UK environmental science.

NERC Council and Executive are supported by the NERC Management Board to advise on practical management and delivery across NERC. NERC maintains infrastructure and teams of people in remote or dangerous locations around the world, and the safety and wellbeing of our teams are paramount. We are embedding the principles of trusted research to safeguard our researchers and the outcomes of their work, and we apply robust governance, risk and financial management to all that we do. Finally, an Assurance Board means we can be confident in our governance, risk, and finance.

We will:

- act as one UKRI as part of the new operating model, stripping out bureaucracy and becoming more efficient to deliver NERC and shared priorities. This spans our community and ourselves: making applying for and reviewing of our funding simpler and easier; and adopting smarter ways of working across NERC and UKRI.
- ensure NERC commissioning is informed by high quality, diverse scientific expertise and advice, including secondments to develop programmes

Diversity and Inclusion Action Plan

We are committed to tackling under-representation in environmental science. Our Living Action Plan (2022–25) sets out what NERC will do to boost diversity and inclusion, including closer engagement with our community, working with our doctoral training partners to ensure recruitment is fair, and publication of data to show that we monitor our funding processes for bias and take corrective action if there is evidence of concern.

of investment, and initiatives to support future leaders through our governance structures, so we continue to foster world leading environmental science.

- demonstrate the ongoing impact of NERC funding and celebrate environmental science that has made a tangible social, economic, and wider contributions to the UK and internationally.
- become environmentally sound across our head-office and institute operations while enhancing scientific productivity, ensuring our policies fit within the overall UKRI sustainability approach to policy formation, estates and facilities, and data and reporting, and develop detailed and costed plans to reach Net Zero by 2040.

Our budget

Budget category ^{i ii}	2022–23 (£m)	2023–24 (£m)	2024–25 (£m)
Core R&I Budgets	288.19	311.36	325.33
Existing cross-UKRI Strategic Programmes	23.95	12.60	9.29
Fund for International Collaboration	9.08	3.60	2.67
Strategic Priorities Fund	14.86	9.00	6.62
Infrastructure*	77.78	69.00	71.75
World Class Labs	30.17	35.25	36.75
Digital Research Infrastructure Programme	2.26	1.14	0.00
Carbon Zero Fund	2.85	0.00	0.00
Existing infrastructure investments: Antarctic Infrastructure Modernisation Programme	35.00	22.00	35.00
Existing infrastructure investments: Rothera	2.00	6.00	0.00
Existing infrastructure investments: UKGEOS	5.50	4.61	0.00
R&I Budgets – existing time-limited commitments	0.37	0.00	0.00
COVID interventions	0.37	0.00	0.00
Grand Total	390.29	392.96	406.37

Notes

- The figures provided in this document are in line with the 2022–23 – 2024–25 budget allocations for UK Research and Innovation. These are broken down by our budgeting and reporting categories, and exclude funding for ODA, Financial Transactions, and BEIS Managed Programmes. Figures are indicative and may vary over the course of the three-year period due to budget adjustments made as a part of on-going financial management and planning processes to maximise the use of our total funding.
- From 2022–23 UKRI talent investments are managed collectively across the Research Councils. The funding for collective talent activities outlined in this delivery plan are accounted for in the broader collective talent funding line included in our Corporate Plan.

* Infrastructure projects are detailed separately below. Note that further infrastructure allocations to Councils may be made during the Spending Review period from the Infrastructure Fund, Digital Research Infrastructure Programme and Carbon Zero Fund Programme.

Infrastructure Fund projects include:*	Total lifetime allocation (some in future SR periods)
Infrastructure Fund: Wave 1 – Full project – Airborne Lab – Infrastructure	49.00
Infrastructure Fund: Wave 2 – Full project – Floods and Droughts Research Infrastructure (FDRI) <i>Subject to business case approval</i>	38.00
Infrastructure Fund: Wave 2 – Preliminary Activities – CO2 Storage Laboratory – Phase 2	2.00

* Further allocations may be made during the Spending Review period. Excludes wave 1 preliminary activities where spend was in 21–22 only. Allocations include contingency, which may be returned if unused.

Image references

Cover	Rare green mosses at Cuverville Island, just north of the Antarctic Circle Credit: Edward Cooper
Page 5	Air Pollution sensor above New Delhi Credit: Ben Langford, UKCEH
Page 13	Glider at Sea Credit: National Oceanography Centre
Page 19	Visitor to Polar Zero Credit: UKRI Asset Bank
Page 21	Moorings being deployed into the Congo Submarine Canyon offshore West Africa Credit: Prof Pete Talling
Page 23	Polar Pride Credit: John Law, BAS



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