



# **Science for the environment: excellent, trusted, applied**

A Science Strategy for the Environment Agency  
November 2023



We are the Environment Agency. We protect and improve the environment.

We help people and wildlife adapt to climate change and reduce its impacts, including flooding, drought, sea-level rise and coastal erosion.

We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

We can't do this alone. We work as part of the Defra group (Department for Environment, Food and Rural Affairs) with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

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# 1. Foreword

**The Environment Agency has a unique role in England. We are a modern environmental regulator, protecting and enhancing the environment in the context of sustainable development.**

We are a place-based organisation. Much of our work in places involves tackling local problems and keeping people safe, be that from flooding or from acute environmental pollution events. We also advise those responsible for shaping local areas, helping them to deliver resilient societal and economic growth alongside environmental protection and improvement. Delivering truly sustainable development means taking decisions and action every day to prevent problems, check compliance or build new solutions or infrastructure. It also means making and advising on longer term plans that will be capable of delivering measurable improvements to people's lives and to the quality of our environment.

The context for those decisions is shifting all the time, perhaps more quickly now than we have seen for many years. Environmental change is being driven by changes to the climate and to the biodiversity that supports ecosystem function and resilience. The economy is changing too, with the transition to net zero creating changes in many sectors at once. And different parts of society are reacting to those challenges in different ways, seeking greater protection, looking for growth opportunities, demanding faster action on environmental issues, or interacting with their environment in new ways.

This rapid and complex change is why we put science at the heart of our planning and decision making. We are equipped with a skilled scientific workforce using a range of technologies and methodologies not only to support our day-to-day work, but also to innovate, scan for future threats

and opportunities, and measure and evaluate progress towards the ambitious goals that have been set.

This strategy sets out how we will support our people, build on our assets, and grow our research capabilities in partnership with others over the next few years. We do this so that our science capabilities can keep pace with the changing needs of the Environment Agency and wider society.



**Dr Robert Bradburne FRSB**

Chief Scientist and Director of Chief Scientist's Group, Environment Agency

## 2. Introduction

### **This is a strategy for Environment Agency science, our scientists, and our scientific research.**

The Environment Agency is here to create better places. That means a resilient nation with healthy air, land and water, supporting green growth and a sustainable future.

The environment is changing and our requirements of it are too. The changing climate, the way we use the environment to grow food, extract other resources and benefits or dispose of our waste are all changing at once, and that is impacting the natural systems that sustain us and keep us safe. So, we need to respond. And that response can only be a good one if we understand what is happening, have the tools at our disposal to respond, know what to do, understand what our impacts are, and can keep learning from our interventions.

This requires the scientific and analytical capability to drive and enable how we work in this space. That capability is required in the natural, data, social and economic sciences, supported by our engineers and other specialists.

The Environment Agency is a Public Sector Research Establishment (PSRE) with a legal duty to carry out research.<sup>1</sup> This science strategy will help to clarify the role of research and science in achieving our aims, supporting the objectives of the recent Nurse review of the UK's research

landscape by clarifying our scientific mission so that we can deliver more impactful science for the whole of society.<sup>2</sup>

We employ thousands of scientists across a wide range of disciplines, and they are the powerhouse that is delivering the science we need. We do science with a purpose – not out of pure curiosity, but through a need to understand our environment and support our activities within it. That is not to say that our science is all short term – we do some very forward-thinking work too, collecting data and carrying out research that will be valuable for years to come.

We also buy science from outside the organisation and grow ever more links with other parts of government and the academic and industrial science base to make sure we're accessing the very best evidence for our work.

But our real strength is in ensuring that science makes a real difference. We do this by working closely with our colleagues across government to understand and meet their needs in a way that they can make best use of the evidence that exists and so drive the most appropriate actions to move us towards the Environment Agency's and government's wider environmental and sustainable development goals.

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1 Our duty – Environment Act 1995 37(5):  
Each new Agency –

(a) shall make arrangements for the carrying out of research and related activities (whether by itself or by others) in respect of matters to which its functions relate; and  
(b) may make the results of any such research or related activities available to any person in return for payment of such fee as it considers appropriate.

2 [Independent Review of the UK's Research, Development and Innovation Organisational Landscape: final report and recommendations \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

### 3. Our vision for science in the Environment Agency to 2030

A thriving scientific community working collaboratively to drive innovation, transformation, and evidence-based decisions and actions in support of environmental improvement, climate resilience and sustainable growth in places across the country.

That means that between now and 2030 we will:

- provide more training, support and development opportunities through our science profession to ensure we have a highly motivated, professional scientific workforce fully engaged with and valued by all areas of the Environment Agency's business
- invest in our science assets – the programmes, technologies, innovation and science facilities that keep us at the forefront of environmental science in the UK so that we continue to meet the current and future needs of the Environment Agency
- conduct, publish and promote highly regarded, quality assured, trusted and utilised science, research and analysis with increasing impact in the Environment Agency, across government and beyond, carried out in greater partnership with other PSREs and wider research organisations

This strategy sets out how we will achieve our mission through delivering to these three areas out to 2030.



## 4. The diverse roles of scientists in the Environment Agency

The Environment Agency is a highly science-based organisation. Whether it's tackling climate change, moving to net zero, understanding the risks posed by chemicals, or managing air, land, water and biodiversity, the challenges we face all require science to inform how we respond.

Scientists support the organisation in several different ways:

- They foster innovation to advance our work and the sectors we work with across the country, progressing potential ideas and research into practical applications.
- They support policy and regulation through technical advice, informing the organisation about what works and what doesn't through evaluation, and what we can improve on through operational science.
- They also offer science services that are highly specialised, such as horizon scanning and forecasting to show the organisation where we are heading and what risks and opportunities lie ahead.

Most of our scientists work in our laboratories and in area teams applying well developed, validated techniques across a range of disciplines and professions to support decision-makers, understand the environment and support our activities within it. These are primarily focused on our operational activities, including our extensive water chemistry, water quantity and ecological monitoring programmes, but they also cover investigations supporting our environmental protection, flood and incident roles, and analysis to underpin our policy and permitting work.

The Environment Agency's research is led by the Chief Scientist through the Head of Research, with dedicated research teams in the Chief

Scientist's Group (CSG) and Flood and Coastal Risk Management. Occasionally other scientists may carry out research as part of their role or for personal development, but all Environment Agency research is conducted to standards set by CSG.

Our scientists work closely with economists and social scientists to design actions to achieve environmental outcomes. This multidisciplinary approach recognises the relationship between the environment, people and the economy. Economists bring insights into the economic drivers behind environmental change and quantify the costs and benefits of different approaches. They evaluate the market dynamics that influence trends, model the economic impacts, and create incentive structures that promote environmentally friendly behaviour. By attaching economic values to ecosystem services and natural capital improvements, economists highlight the tangible benefits of investing to improve the environment. Social scientists help us understand how people might respond to the solutions. For example, our net zero science programme is exploring the likely environmental and social implications of new technology for places and communities in England. It is also ensuring that the scientific evidence that underpins our response to drought incorporates economic analysis of water resource management options and research on social responses to water use restrictions. By working together, scientists, economists and social scientists form approaches that promote environmental improvement, economic growth and social acceptability.











The impact of Environment Agency science is far reaching. Through our Chemicals Assessment Unit, we provide specialist advice to Defra and the Health and Safety Executive on chemical toxicity. Our researchers are part of a major collaborative research effort to understand the role of the

environment in antimicrobial resistance. We have developed innovative imaging technologies, to improve how farmers can reduce their environmental impact and developed an interactive tool and guidance to predict future flood risk. Our 'State of the environment' reports provide assessments of environmental problems, and our monitoring programmes and work on natural capital accounting are providing the data and approaches that will be used for the government's Natural Capital Ecosystem Assessment (NCEA). Through our future challenges programme, we are exploring how England can achieve a clean energy future in a way that maintains a healthy environment and thriving communities; our science is relevant and purposeful both for now and the future.

But the world is changing, and as our five-year plan, EA2025 points out, the Environment Agency also needs to change. So, science has to open up new possibilities for ways of working and investigate how new technologies can help or hinder our progress towards our goals.

This underlies the importance of having a science strategy. We need to be clear about what we need most from science over the next few years to make sure it stays on track and makes the most of these new opportunities. That science will come from our talented people, using the scientific and knowledge assets at their disposal, and the science that we do ourselves and in collaboration with others.

## Science in the Environment Agency

				
				
<b>Field activities</b>	<b>Laboratory work</b>	<b>Research</b>	<b>Evaluation, analysis and reporting</b>	<b>Informing decisions</b>
Monitoring, measuring and observing the environment, regulatory work, flood and coastal risk management and incident management.	Method development, sample analysis, quality assurance, and data compilation and analysis in support of the full breadth of the Environment Agency's functions.	Developing and assessing new knowledge, methods, tools and scientific insights to underpin the Environment Agency's work.	Analysis, evaluation and interpretation of data and information to ensure the Environment Agency has the science and evidence to deliver its commitments.	Provide the scientific leadership, advice, foresight and evidence needed to inform decisions.

## 5. People and skills

**Scientists play a central role in the work of the Environment Agency, underpinning our daily work and ensuring we scan the horizon and prepare for future challenges and opportunities. This strategy sets out some of the ways in which we will provide more training, support and development opportunities to ensure we have a highly motivated, professional scientific workforce fully engaged with and valued by all areas of the business.**

Our teams employ a diverse range of skills, covering evaluation, research and innovation, modelling and data analysis. They cover disciplines as diverse as physics, chemistry, biology, geomorphology, hydrology and ecology, with specialisms in air quality, water quality, waste and recycling, climate change, groundwater, hydrology, geomorphology, fisheries science, ecosystems, data science, ecotoxicology, science communication and social science. We also have strong links to economics and engineering and to data science, generating greater insight to our data and evidence.

We invest in those scientists growing their expertise and skills. We run our own development network to build our talent, holding regular science webinars with internal and external speakers. We also plan to develop specialist training and support for working scientists, providing improved assurance and support for those doing research outside of the centralised teams to encourage robust innovation and research throughout the organisation. Over 1,400 people – more than 10% of the staff of the Environment Agency – have joined the science profession since its inception in 2021, which is recognition of the important role that science plays in a broad spectrum of the work that we do.

Our ambition is to build on the Environment Agency's strategic workforce plan and increase training and development opportunities for our scientists to ensure they have a rewarding career. We will work with professional bodies to help them gain accreditation, increase our internal networks, specialist sub-groups and mentoring opportunities. We will also promote greater movement both within and outside of the Environment Agency and will work with other scientific organisations across the Defra group to forge closer links and knowledge exchange between professions and experts and create greater opportunities for our scientists.

We are nurturing the current and next generation of scientists from all backgrounds and disciplines. This includes our PhD programme, working closely with UK research councils to shape and provide research fellowships, and hosting academic internships for undergraduates and recent graduates each summer. We will continue to seek new partnerships with universities and other external organisations to grow the pool of scientists with experience of working directly with us.

The Environment Agency's scientific workforce is not representative of the communities we serve. Spanning all our work on people, therefore, is the recognition that we need to increase the diversity of our workforce to expand our range of technical knowledge and provide different perspectives to help us access, listen to, understand and incorporate information and evidence into our science and analysis. We have started this process through our internships, apprentices and our LINK programme (linking black, Asian and minority ethnic colleagues from across the Environment Agency with senior leadership teams in the Environment and Business Directorate). All of this will help us achieve some of our fundamental goals in reaching out to different

communities to build the collective knowledge and understanding needed to create a better environment. We will continue to work with and through the Government Science and Engineering Profession as well as other routes to expand our activities in this area.

### **Case study – Women in science and engineering**

The Women in Science and Engineering Network is part of our Gender Equality Network.

We aim to celebrate all the talented women scientists and engineers working in the Environment Agency, whatever their discipline, by providing peer support in developing their careers and encouraging them to pursue science and engineering either within or outside the organisation.

Each year we base our celebrations around International Day of Women and Girls in Science on 11 February and International Women in Engineering Day on 23 June. We have used these occasions to raise the profile of our outstanding women scientists and have also encouraged women to take part in outreach activities to encourage more girls into a scientific career.



### Case study – Science intern programme

Each summer, the Chief Scientist's Group (CSG) welcomes new interns into its teams. Some interns join as part of the CSG's academic summer internship programme which provides valuable hands-on experience across a variety of CSG research priorities helping to inspire the next generation of environmental scientists.

Other interns join as part of the Summer Diversity Internship Programme, an Environment Agency-wide initiative which forms part of our Equality, Diversity, and Inclusion strategy and offers a broad range of roles spanning our core business areas.





## 6. Scientific assets

**The Environment Agency holds a unique position in having the people and scientific facilities to remain at the forefront of certain aspects of environmental science in the UK. We will invest in our scientific assets – the data, technologies, and science facilities that enable us to continue to meet our current and future needs.**

We do not operate in isolation. We recognise that we must also be outward looking to ensure we get the best value for any investment in science, innovation and equipment, and are able to meet our current and future evidence needs efficiently.

### 6.1 Our programmes and the data they generate

We operate a wide range of extensive and intensive monitoring programmes and networks that include rivers, lakes, groundwater, and coastal and marine environments. We collect, archive, analyse and share essential data on a vast range of parameters that can be used individually to diagnose specific issues and can be pooled together to gain an integrated understanding of the health of the environment.

We use this data to protect people, places and the environment by tracking the dynamic changes in England's water environment. We also use it to support our regulation, fisheries and permitting activities, forecasting risk and assessing the effects of flood and environmental incidents. We investigate the causes and impacts of poor environmental conditions and use our knowledge to plan and implement changes to secure environmental improvements including evaluating whether improvements have achieved the intended outcomes.

We already produce an array of highly assured reporting products, ranging from daily reports on levels of bacteria at designated bathing waters through to triennial targeted assessments of the condition of freshwater ecology. When we report this data, we do so in a way that allows others to interact with it either by allowing them to build their own apps (taking advantage of our open data culture) or by developing our own interactive tools and putting these in the public domain for example [SWIMFO](#), or the [hydrology data explorer](#).<sup>3</sup> We also produce a range of 'State of environment' reports that draw from evidence across business, industry and regulators. These provide an evidence-based platform for us to promote key messages.

Looking forward we will need to adapt and evolve our monitoring not only in what we measure, but how we measure, and how we communicate this data and information. Increased investment in new technology will help us meet new demands but will also change our approach so that we augment our state of the environment evidence with data on pressures, risks and impacts of human activity, as well as the effectiveness of responses. We will also link monitoring across scales, categories and 'source to sea' to achieve significant efficiency and information gains across all levels, enabling richer interpretations, better targeting of hot spots, risk analyses, judging of policy effectiveness, and achieve lower information costs.

Working with others will be a critical part of our future strategy. Together with our partners, we will gather catchment data and use available third-party data to develop intelligence to target action, investment and advocacy. This includes building data such as storm overflow monitoring into our approach and aligning monitoring programmes with other organisations.

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<sup>3</sup> <https://environment.data.gov.uk/bwq/profiles/>  
<https://environment.data.gov.uk/hydrology/landing>

### Case study – Natural Capital and Ecosystem Assessment

The Environment Agency is leading the water components of Defra's Natural Capital and Ecosystem Assessment (NCEA) programme which will provide high quality national and local insight to enable us to accurately assess the condition and change to our biodiversity, ecosystems and natural capital assets. This insight will be critical to ensuring the value of natural capital is fully considered in future and national decision making.



### Case study – Catchment Sensitive Farming

For Catchment Sensitive Farming (CSF) we provide a detailed evaluation of water quality benefits achieved as a result of providing on-farm advice. Using a combined monitoring and modelling assessment, we have been able to evaluate and attribute environmental change to this specific policy initiative and are looking to explore how we expand this to the evaluation of wider agri-environment policy.



## 6.2 Technology and laboratories

The Environment Agency uses a range of assets and facilities to support our evidence needs.

We have extensive expertise in remote sensing, operating survey grade airborne Lidar to provide data and services that are used for multiple monitoring applications from intertidal habitat and coastal erosion monitoring to illegal waste site mapping and regulation. We are also investigating how we can make further use of satellite imagery and artificial intelligence to improve our measurements and observations.

Drone operations are becoming part of our business-as-usual activities, with investment in people and equipment and testing new approaches, such as drone Lidar, collecting water samples or inspecting culverts remotely.

We operate onboard a fleet of coastal survey vessels, providing a range of estuarine and coastal surveys that monitor the state of the

environment around the coastline. We have a dedicated national water quality instrumentation team providing continuous monitoring for both water and air quality instruments using state-of-the-art equipment and facilities.

Our laboratories in Exeter and Leeds specialise in the analytical and diagnostic disciplines of chemistry, micro and molecular biology. Our fish laboratory in Bampton covers a range of techniques from fish disease diagnostics and monitoring, and invasive species identification to techniques such as eDNA, fish ageing and ecology assessments. Supporting fish stocks is an important part of our role and we have fish farms at Calverton producing coarse fish, and at Kielder, focusing on the rearing and release of juvenile salmon and sea trout as an offset for the impact of the creation of Kielder Reservoir. We also run a complementary programme rearing and releasing the endangered freshwater pearl mussel to north east river catchments. We work with experts at

universities, non-governmental organisations and other similar facilities/programmes both within the UK and internationally, sharing best practice and learning from others.

We recognise the need to invest in our facilities. Capturing innovation will play a big part in this. Updating our existing assets and exploring new approaches and technology will ensure we continue to meet our evidence requirements and stay at the forefront of monitoring and observation science.

### 6.3 Supporting technological Innovation

Innovation and using new technology are fundamental to our work. We will need to find innovative ways of understanding and managing the environment to solve the environmental challenges we face today and tomorrow.

We have developed cutting edge technologies such as non-target analytical screening methods to detect emerging chemicals and eDNA surveys to identify the presence of native, white-clawed crayfish, invasive signal crayfish and crayfish plague. We will increase our use of real-time data, remote sensing, genetic sequencing, citizen science and earth observation to augment existing monitoring approaches and answer questions about the environment. We will also invest in data literacy skills, analysis-ready datasets, portals, modelling, and real-time/near-time dashboards to generate new intelligence to drive action.

We recognise that embedding more innovative approaches to data science will be the key to fully exploiting our own, and external data stock. To do this we need to understand the data science infrastructure the business requires to exploit modern methods in our future digital world. This will largely focus on cloud computing capabilities, reproducible analytical pipelines and their (along with any other outputs) storage, and the infrastructure required to ensure this is carried out in a resilient way. We will build strong data science and analytics skills /capabilities within the organisation by providing guidance, training and communities of practice.

Putting the above in place, will enable us to drive our business through robust and transparent insights, achieving better outcomes for the environment and improving efficiency. This should also enable us to leverage more innovative data science methods such as artificial intelligence, robotics, machine-to-machine learning and next generation modelling.

We will need to continue our investment in innovative and new (to us) techniques to build our capacity and capability. This will include working with others who might be developing similar techniques that could be adapted and deployed to meet our needs and working with Defra's innovation programme to provide test beds for new techniques and technology.

#### Case study – X-ray fluorescence

X-ray fluorescence (XRF) technology has emerged as a powerful tool in environmental regulation enforcement. This non-destructive analytical technique can rapidly and accurately identify chemical elements present in various materials, be it soil, water, or air pollutants. XRF devices have revolutionised regulatory compliance by enabling real-time, on-site analysis, reducing the need for inefficient sample collection and laboratory testing.



### Case Study – Flood and coastal risk management

We are working with Network Rail to investigate how novel methods, involving bacteria, may be used to stabilise peat embankments (or levees). This work will focus on embankments that are failing due to changes within peat soils (for example, caused by drying and wetting or compression and changing structure). It will explore soil stabilisation methods and look at the potential use of bacteria to strengthen peat embankments and reduce settlement.

We are also developing and testing methods for incorporating smaller, more agile x-band radar systems into the UK Meteorological Office's national precipitation products. If successful, data quality gaps in our national rainfall radar network could be resolved within months rather than decades, allowing us to make relatively rapid improvements to our warning service where rainfall data quality currently makes flood forecasting difficult.





## 7. Scientific research

**The Environment Agency uses science and scientific research to frame and answer the questions that are most relevant to our strategic aims and statutory duties, and interpret the data and information to protect the environment, people and places.**

We also work closely with the best in government, research, academia and industry to address the science questions in our areas of scientific interest.

We will continue to conduct, publish and promote highly regarded, quality assured, trusted and utilised science, research and analysis with increasing impact in the Environment Agency, across government and beyond. We will do this in greater partnership with other PSREs and wider research organisations.

The Environment Agency's science needs are very diverse. We are interested in many of the research and innovation interests set out in [Defra group research and innovation interests - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/defra-research-and-innovation-interests): Tackling climate change and achieving net zero, understanding land use change and nature based solutions, 'one health', measuring natural capital, and reducing unwanted impacts of chemical use.

We will also do science in all three 'tools' areas:

- behavioural and social science
- systems and futures
- environmental monitoring and data science

Within these diverse areas of interest, we will focus on the science questions that are most relevant to our strategic aims and statutory duties.

### **7.1 A nation that is ready for, and resilient to, climate change**

The climate is changing and will continue to change throughout the rest of the century. The rate and impact of climate change is uncertain, but increasing global temperatures are likely to lead to more extremes of weather, with impacts on human health, ecosystems and the economy both in the UK and worldwide. Our work focuses on understanding the range of possible impacts on people and the environment, and in identifying effective ways to adapt to or accommodate the change, while contributing to sustainable development and an improved environment.

### **7.2 Healthy air, land and water for people and wildlife**

We rely on the natural world for the air we breathe, the water we drink and the land that provides food and energy. Much of the natural world is influenced or controlled by what people do. This includes aspects of the environment that are often invisible: air is transparent, and groundwater and uplands are largely out of sight, as are microbes and chemicals. Our work seeks to improve understanding of the impacts and pressures on the environment and to identify better ways of monitoring and managing the land and water to benefit society and minimise harm to people and the environment.

### **7.3 A clean, green sustainable future**

The UK government has committed to reduce all greenhouse gas emissions to net zero by 2050. The road to net zero will require a range of new technologies and approaches, many of which the Environment Agency is likely to regulate. We are using science and evidence to ensure the environment is part of a sustainable and equitable transition to a low-carbon economy. We are [building on years of experience in this space](#) to expand our

research portfolio.<sup>4</sup> Current interests include net zero pathways, exploring the effectiveness of ground source heat pumps, estimating embodied carbon emissions and understanding the environmental implications of novel sources of energy and the drive to net zero.

#### 7.4 Informing regulation

The Environment Agency regulates a wide range of regimes and sectors. We need science to inform, underpin, improve and otherwise support our regulatory function, to help us make sure that people and the environment are protected.

We regulate in line with the Regulators' Code<sup>5</sup> to be an enabling regulator and in line with the Growth Duty.<sup>6</sup> We have made clear commitments to help support innovation, while acting as an objective, robust and independent regulators to ensure continued protection of people and the environment.<sup>7,8</sup> We carry out research into new technologies that we will regulate and into novel regulatory approaches that can help support the implementation of sustainable innovation.

#### 7.5 Flooding and coastal risk management

Our Flood and Coastal Erosion Risk Management Strategy sets out a long-term vision for a nation ready for, and resilient to, flooding and coastal change - today, tomorrow and to the year 2100. Scientific research has a crucial role to play in achieving this vision and working towards an ambition to see the nation recognised as a world leader in researching flooding and coastal change. Our research priorities align to this ambition and are outlined in our five-year [Flood and Coastal Erosion Risk Management Research and Development plan \(from 2023 to 2028\)](#).

Our priorities are to research how we better:

- prepare – improve our understanding of risk, increase societal resilience, and enhance our approach to funding and investment
- respond – both during future flood incidents and in recovery, supporting the design, operation and performance of our assets in a changing climate
- innovate – using novel digital technologies, supporting our organisational ambitions for net zero carbon and sustainability, and providing an improved evidence-base on the use of nature-based solutions

#### 7.6 Incident management and resilience

Incident management is one of the highest priorities in the Environment Agency and cuts across all aspects of our work. At present, environmental harm is reported every seven minutes, and with the increasing pressures on our environment from the changes in climate and population growth, the risk of harm is growing.

One of the goals of our EA2025 strategy is “a nation resilient to climate change” and we are helping build and achieve resilience through planning for changing risk, inspiring action through partnership, and responding to the climate emergency.

To achieve this, we need to ensure that we have an incident management system that is robust, flexible, and able to meet the demands of our changing world. Our scientists work with organisations such as the Met Office and National Fire Chiefs Council to capture, forecast and respond to incidents. We are always seeking to ensure this service is underpinned by the best data and science.

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4 [www.environmentagency.blog.gov.uk/2021/10/21/achieving-net-zero-keeping-people-and-nature-in-mind/](http://www.environmentagency.blog.gov.uk/2021/10/21/achieving-net-zero-keeping-people-and-nature-in-mind/)

5 [www.gov.uk/government/publications/regulators-code](http://www.gov.uk/government/publications/regulators-code)

6 [www.gov.uk/government/publications/growth-duty](http://www.gov.uk/government/publications/growth-duty)

7 [www.gov.uk/government/publications/environment-agency-regulatory-statement/environment-agency-regulatory-statement](http://www.gov.uk/government/publications/environment-agency-regulatory-statement/environment-agency-regulatory-statement)

8 [www.gov.uk/government/publications/regulating-for-people-the-environment-and-growth-2021](http://www.gov.uk/government/publications/regulating-for-people-the-environment-and-growth-2021)

Key research aims include:

- ensuring that our incident management service is rooted in a systematic understanding of risk, including risk associated with investment in resilience and with climate, policy and regulatory changes
- supporting vulnerable communities by investigating possible economic and social impacts and understanding how to support them best to recover quickly following incidents
- evaluating and improving our approach in the face of climate and other technological change, making sure it is data and insight-led, and based on the best science and practice around incident management

### Case study – Flood hydrology

In March 2022, the Environment Agency published the UK Flood Hydrology Roadmap, which sets out a vision and action plan for flood hydrology in the UK for the next 25 years. It considers all sources of inland flooding, including fluvial, pluvial and sewers, groundwater and reservoirs. It also considers all inland flood hydrology activities in the UK, from operational practice to scientific research.

We have committed to delivering aspects of the roadmap through our Flood Hydrology Improvements Programme. The programme has focused on improvements to three work areas: data, methods and ways of working.



## 7.7 Evaluation

We provide evaluation expertise and work with the business to understand what works, drive continuous improvement and ensure the Environment Agency's resources are being used effectively. Our unique understanding of, and access to, many datasets enable robust and objective evaluation of the organisation's work. We provide bespoke assessments for a range

of our environmental interventions, as well as helping the business to embed evaluation in all its activities. We evaluate both the short and longer-term outcomes and benefits from the Environment Agency's activities on the ground, helping ensure the organisation is as effective and efficient as it can be and delivers the benefits communities want to see.

### Case study – Evaluation of waste crime

Waste crime is a persistent problem which costs the UK economy an estimated £1 billion per year. We run a National Waste Crime Survey that estimates 18% of all waste is illegally handled at some point in its existence. The financial gains of waste crime are large, and our evaluation tells us that our enforcement is 'necessary but not sufficient' if we are to eliminate it. We are investigating how the Environment Agency can exploit deterrence theory to make our interventions more efficient and effective.



## 8. Increasing the impact of our science

### 8.1 Partnership working

The Environment Agency needs excellent science and robust research to create a better place for people and wildlife. We cannot produce this alone. We need to strengthen the partnerships we currently have and foster new ones to make best use of the knowledge, expertise and funding that is available across the UK and internationally.

The UK and international research landscape in areas relevant to the Environment Agency's work is complex and includes a wide range of research funders, producers and users. We occupy a unique space within this landscape as we produce our own research, use others' research and translate it into practice, provide a bridge between science and policy, and can apply for research council funding as a PSRE. Therefore, we focus our effort on working with the research organisations that are closest aligned to our remit and our research needs.

#### 8.1.1 UK partnerships

We work with government departments, public bodies, academia and industry across a wide variety of sectors and disciplines. We lead and participate in partnerships to co-design, co-develop and co-deliver science that supports policy development and solutions to improve operational activities. Our range of environmental protection responsibilities make us a leading research user and our expertise and extensive data sets are an important research capability and resource.

#### Defra group and other government departments

We work across the Defra group where our interests intersect such as the boundary between fresh and salt water in the coastal margins, to jointly deliver the Natural Capital Ecosystem Assessment programme, Flood and Coastal Erosion Risk Management Research and

Development Programme and the Joint Water Evidence Programme with Defra. We also work with Department for Energy Security and Net Zero on research into the environmental impacts of net zero technologies and approaches, and climate change impacts and adaptation. In the future, we will strive to achieve greater data integration and more holistic, cross cutting science working across the Defra group and wider UK government. We will share expertise in applying new innovations and technologies, learning from each other about how to incorporate them into the work we do. We will also encourage greater skill sharing and interchange between our scientists to support their development and the technical resilience of the Defra Group.

#### PSREs and public bodies

We work with all the UK and Irish environmental regulators to exchange regulatory knowledge and expertise, and identify common evidence needs. Looking forward, we will build on our existing relationships with the Met Office, to increase resilience to environmental hazards and climate change, and the UK Health Security Agency on issues that affect the environment and health, such as antimicrobial resistance and air quality.

#### Research funders and academia

We already have many excellent relationships with the UK research councils, research institutes, universities and academics. We will look to grow and strengthen these collaborations to shape future research funding programmes and improve knowledge exchange from existing and new research. We will expand our support for the next generation of environmental scientists, so that they are equipped to address future environmental challenges. We will also optimise our role as a PSRE by working with universities and research institutes to jointly design and carry out science and research that will inform decision-making and solve real world challenges.

### 8.1.2 International engagement

We work with the international science community to build our reputation as a world-class environmental regulator and practitioner. We anticipate emerging environmental risks, help develop new international standards, and access the best scientific evidence and expertise by sharing our knowledge and experience and learning from European and global partners.

To balance the opportunities and costs of such engagement, our focus for international work is to:

- seek advantages for all partners in any collaboration, seeking to achieve benefits beyond those possible working at a national level
- support Defra and the wider UK Government's international science engagement and capacity building where this is a UK Government priority

We will maintain and look to grow our international partnerships with environmental protection agencies and world-class research institutes. We will focus our efforts where we can learn the most, build global resilience and regional capacity, and develop solutions to tackle the worldwide climate and nature crises.

### 8.2 Communicating our science and analysis

Science of the environment is complex. For it to be used and have impact, we need to translate and present it in clear and compelling ways. We currently do this by publishing our science on GOV.UK, making our data available via data.gov and promoting our outputs via X (Twitter) and other external channels:

- find our research and science reports [on GOV.UK](#)
- view our [data](#)
- use our guidance and tools, such as the [Natural Capital Register and Account Tool](#)
- follow our Chief Scientist on X ([Twitter](#))

We will continue to publish our work and make it freely available in the public domain. And we will continue to do more to explain our work clearly so that it is understandable and engaging to those who need to use it.

We will tell our science stories through a larger range of media, so that they appeal to and reach a wide audience. We will analyse, synthesise and make our science relevant to today, ensuring science underpins the Environment Agency's wider story.

We will also continue to develop new tools and visualisations to enable more people to make better use of our data and knowledge, being clear about what we do and what we don't know and how our science can be robustly and correctly used.

### Case study – Examples of current Environment Agency scientific international engagement

- **Chemicals** – we work with the Organisation for Economic Co-operation and Development, the European Chemicals Agency and the Partnership for the Assessment of Risks from Chemicals to improve and harmonise chemical hazard and exposure assessment methods. We also provide a chemical regulatory service on behalf of the UK government.
- **Floods** – we work with the United States Army Corps of Engineers and the Dutch Rijkswaterstaat to produce joint research, exchange knowledge and share operational experience in areas such as flood barriers, levee and embankment safety and natural flood management.
- **Antimicrobial resistance** – we are part of the international collaboration on the One Health response to Antimicrobial resistance, which is led by the United Nations Environment Programme. We engage with international experts and influence global decisions on the development, transmission and spread of AMR in the environment.
- **Air quality** – we have a long running transatlantic collaboration with the United States Environmental Protection Agency on air quality science. Through this partnership we share data, methods and expertise on air quality regulation, modelling and exposure to support sound environmental policy decisions in the US and the UK.

## 9. Conclusions and next steps

This is an exciting time for environmental science, with many new opportunities to address some huge societal challenges. The Environment Agency remains committed to playing its role in delivering that science, often in partnership with others, but using its unique strengths and position to enable that science to drive practical change and improvements in places across the country.

This strategy will be implemented over the next seven years. During that time, the Chief Scientist's Group will track progress against the three pillars of the strategy to drive a culture of constant improvement in the way that we work and the impact that our science has on the functioning and future of the Environment Agency.



