



**ECONOMIC IMPACT  
REPORTING  
FRAMEWORK**



**Report for 2009/10  
November 2010**

# 1. Executive Summary

## *Introduction*

The Economic Impact Reporting Framework (EIRF) report is requested by the Department for Business, Innovation and Skills (BIS) as part of its performance management system for the Research Councils.

The report demonstrates the value and impact of NERC science and the role NERC plays in supporting the science base through a series of primarily quantitative measures. It complements the wider view of NERC investments and activities reported in the Annual Report, [NERC Economic Impact Baseline](#) and [NERC Delivery Report](#) and [Scorecard](#).

## *Excellence with impact*

Research Councils UK (RCUK) is ensuring that the UK is a world leader in a global market. To tackle the greatest challenges facing society RCUK is working in partnership to provide the essential research and skills for the UK, to have a productive economy, and healthy society and to contribute to a sustainable world.



NERC is the UK's main agency for funding and strategically directing research, training and knowledge exchange in the environmental sciences. NERC is committed to supporting excellent research and increasing the impact of its investment in research and training, to build a sustainable UK economy and improve quality of life.

This report illustrates through five areas of impact, that NERC continues to support the highest quality research:

- Overall Economic Impact
- Investment in the Research Base
- Knowledge Generation
- Innovation Outputs and Outcomes
- Public Engagement

## **Overall Economic Impact (Section 2)**

- NERC is providing essential research and advice to government on Carbon Capture and Storage (CCS). The North Sea CCS business is projected to be worth £3.0-6.5 billion p.a. by 2030.
- The Flood Forecasting Centre (FFC) is using NERC's Centre for Ecology and Hydrology (CEH) Grid-to-Grid models to help protect £214 billion worth of assets vulnerable to flooding.
- NERC research has led to the development of a low cost seed mix that can increase bee and butterfly numbers 30-fold. Bees are vital pollinators with the value of pollination services to UK crops estimated to be worth £440 million p.a.

## **Investment in the Research Base (Section 3.1)**

- £162 million in other income generated in the last three years.
- A total of £149 million investment committed through the two phases of the Theme Action Plans (TAPs), developed to implement NERC's science strategy.
- 40 Living With Environmental Change (LWEC) programmes launched, by the end of the current spending review period; it is estimated that £237 million will have been committed by NERC to LWEC.

## Knowledge Generation (Section 3.2)

- Over the past three years, NERC has funded over 2,000 highly skilled post-graduates to industry and the public sector.
- 2.3% of NERC-funded ISI journal publications achieved outstanding citation impact, compared to 1% of papers worldwide.
- In 2008 the UK progressed to become the G8 leader for environmental sciences as measured by citations impact.
- The proportion of publications in ISI journals has risen to 62% of the total in 2009, indicating, in conjunction with an increase in international co-authorship, that NERC is sustaining its high impact amongst the research community.

## Innovation Outputs and Outcomes (Section 3.3)

- A growing number of projects relevant to policy provided advice to government; 34% of projects gave advice in 2009/2010, a 26% growth in two years.
- External funding for research continues to increase and was £39.1 million in 2009/10.

## Public Engagement (Section 3.4)

- NERC continues to promote the importance of engagement between the research community and the public, indicated by 25% growth in the number of public engagement events in two years.

## 2. Overall Economic Impact

### NERC research contributes to economic growth and wellbeing in the UK

NERC makes a substantial contribution to building a sustainable economy and improving wellbeing by maximising the economic impact of its investment in excellent environmental research and training. NERC science is not just about finding solutions to problems, but grasping opportunities and driving innovation for the green economy. NERC investment is driving the UK's lead in environmental sciences and providing the right platform to make NERC and the UK an attractive investment option and partner.

This section provides three case studies to demonstrate some of the impacts and benefits of NERC-funded research on the economy and wellbeing. More detailed coverage of the impact of NERC research can be found in the [NERC Economic Impact Baseline](#), which is published alongside the [NERC Delivery Report](#).

### Case study 1: Growing the economy

The UK is playing a global lead in Carbon Capture and Storage (CCS), providing opportunities for businesses, creating jobs and attracting inward investment. NERC is providing essential research and advice to government on the regulatory framework for CO<sub>2</sub> storage, site characterisation, storage capacity, and site monitoring. CCS technology is widely regarded as critical for reducing carbon emissions, given the predicted continued reliance upon fossil fuels throughout this century. CCS has the potential to reduce CO<sub>2</sub> emissions from power stations by around 90%<sup>i</sup>. It is estimated that the value of the North Sea CCS business could be **£3.0-6.5 billion p.a.** by 2030, sustaining between 70,000 and 100,000 jobs<sup>ii</sup>.

The UK Carbon Capture and Storage Consortium is proposing a safe and economic method for capturing and storing man-made CO<sub>2</sub>, by injecting it deep into the ground where it dissolves in groundwater. In May 2009 a research study<sup>iii</sup> into opportunities for CO<sub>2</sub> storage around Scotland was launched by the Scottish Centre for Carbon Capture and Storage (SCCS). It was led and managed by NERC's British Geological Survey (BGS) as one of the partner institutes of SCCS. The study, the most comprehensive undertaken in the UK, was achieved by collaborative partnerships, involving business, universities and research facilities.

BGS research has provided information on where natural gas supplies can be stored to help improve the UK's energy security. Their research supports the views that man-made salt caverns and depleted oil and gas fields generally have the best potential for gas storage. As the UK only stores between 11 and 14 days' supply of gas, developing more storage facilities is vital<sup>iv</sup>. BGS is at the forefront of research into underground gas storage and their work is already generating international attention.

### ***Case study 2: Protecting people, property and business against flooding***

Climate change will probably bring more frequent and more intense storms to the UK, in turn leading to more floods. The UK has assets worth **£132 billion at risk** from coastal floods, **£82 billion vulnerable** to river floods, and **£8 billion threatened** by coastal erosion<sup>v</sup>. NERC research increases knowledge about the frequency, intensity and behaviour of extreme weather, river flows and storm surges that flood our rivers, estuaries and coasts. An example is The Flood Estimation Handbook<sup>vi</sup> widely used by engineers, planners, policy makers and insurers to predict flood frequency. The handbook developed by NERC's CEH contributes to preventive actions such as the design and planning of flood defences, it is estimated that up to £34 million in avoided costs have been achieved<sup>vii</sup>.

The Flood Forecasting Centre (FFC), established in April 2009 is a partnership between the Environment Agency (EA) and the Met Office to forecast river, tidal and coastal flooding, as well as extreme rainfall, which may lead to surface water flooding. The information FFC provides to decision-makers and emergency responders is dependent on NERC's CEH contribution to Grid-to-Grid (G2G) hydrological models. The new G2G models are being used to give finer detail in forecasting flood risk at more specific locations, especially where river flow monitoring is absent and to improve warning time of the flood forecast systems that support our national flood management capabilities.

The University of Reading, working closely with the Met Office, is leading one of the projects within the NERC Flooding Risk from Extreme Events programme that uses ground-based radar to improve the accuracy of where severe storms are likely to occur. By monitoring humidity in the lower levels of the atmosphere this creates the possibility of providing 2-3 hours extra warning of extreme events, addressing one of the key conclusions of the Pitt Review.

To help mitigate flood risks in parts of Oxford, NERC's BGS models and associated software have been applied by EA in England and Wales, safeguarding properties, worth an estimated **£46 million**. Reducing costs by just 20% could produce savings from reduced insurance claims equating to £1.2 million from a single flooding event<sup>viii</sup>.

### ***Case study 3: Protecting water and food supplies.***

Ecosystems underpin all human life and activity, providing food, clean air, water, health and recreation to people around the world. Food and water security, renewable energy and a green economy all depend upon the conditions and processes and the species that make them up to deliver these goods and services. NERC research provides essential evidence to manage and exploit these environmental services for a productive economy, a healthy society and a sustainable world.

In 2009/10 NERC began co-funding the LWEC Insect Pollinator Initiative, working in partnership with the Biotechnology & Biological Sciences Research Council, the Department for Environment Food and Rural Affairs, the Scottish Government and the Wellcome Trust. The initiative will investigate the factors that lie behind the decline in pollinators. Over the past two years, for example the number of honeybees in the UK has fallen between 10 and 15 percent. The initiative will build on the pollinator research undertaken by NERC's CEH 'Buzz project', which developed low-cost seed mixes that can increase bumblebee and butterfly numbers by up to 30-fold. This project underpins Operation Bumblebee, sponsored by Syngenta and Sainsbury's which has worked with more than 600 farmers to produce 1,000 hectares of pollen and nectar rich habitat. The economic value of pollination services to UK crops is up to **£440 million pa**; equivalent to **13% of farming income**<sup>x</sup>.

Research provided a breakthrough to improve sustainable food production. The work, funded by NERC and HDB-Horticulture and undertaken by scientists at Lancaster University and Stockbridge Technology Centre, discovered that treating tomato seeds with jasmonic acid (JA) resulted in protection against pests for up to eight weeks after germination. Jasmonic acid is involved in controlling a plant's natural defences against pests, but it had not been anticipated that it would provide protection for so long. The technology was assigned to Plant Bioscience Limited, which promoted the technology to the international agricultural products industry. In June 2009, following extensive field trials, Becker Underwood Inc. of Ames, Iowa, entered into a worldwide exclusive licence for the use of the seed treatment.

A review was undertaken of the best science to define the maximum amount of water that can be taken from different rivers while still meeting ecological goals. This was led by NERC's CEH, involving a large team of academics, EA colleagues and other water abstractors. This builds on the river flow predictions developed by CEH and spin-out company Wallingford HydroSolutions provided to EA to inform their Water Resources strategy report<sup>x</sup>. The report predicts that the effects of climate change will reduce the amount of water in rivers by 10-15%, rising to at least 50% in the summer. These predicted reduced river flows, combined with an expected population increase, have led EA to recommend 'near universal' water metering, a review of the water industry's structure, and actions to reduce water consumption. This will have major implications for farmers, and water and power generation companies.

### 3.1 Investment in the Research Base

Investments in the research base have effects on overall economic impact, as well on knowledge generation and innovation. NERC ensures that world class research is delivered as efficiently as possible, maximising the impact of investment.

#### 1. Value of NERC Departmental Expenditure Limit

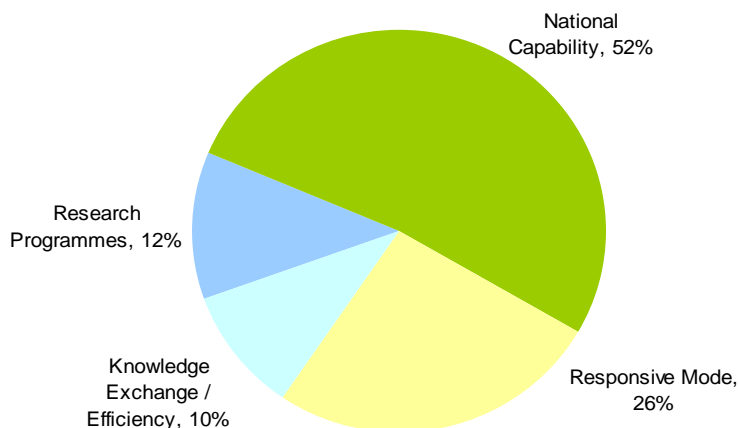
	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Resource	£342.2m	£371.5m	£381.3m
Capital	£46.7m	£45.7m	£58.1m
Total DEL	£388.9m	£417.2m	£439.4m
Other income	£48.3m	£52.7m	£60.6m
<b>Total Income</b>	<b>£437.2m</b>	<b>£469.9m</b>	<b>£500.0m</b>
% Other income	11%	11%	12%

*Draft figures, post audit. Further analysis of income and expenditure can be found in the NERC Annual Report and Accounts 2009/10.*

The investment made by the Government in NERC through the Department for Business, Innovation and Skills (BIS) is described as the Department Expenditure Limit (DEL).

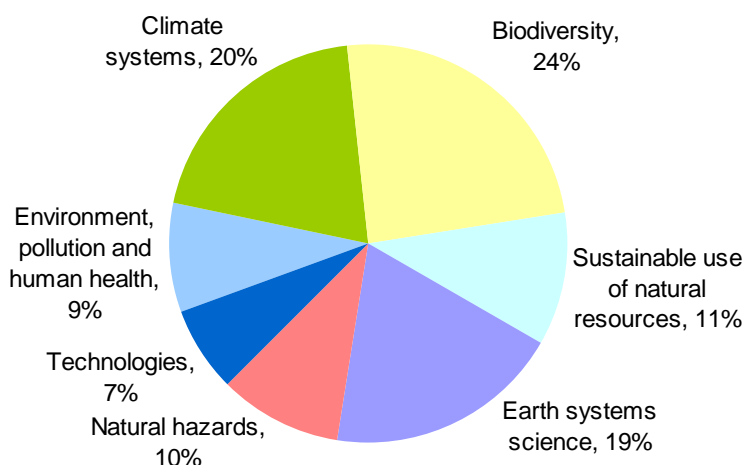
Over the past three years the investment has totalled over £1,245 million. NERC has also generated nearly £162 million in income over this period from other sources.

## 2. Allocation of science budget split by funding streams



NERC funds science through three main funding streams: National Capability, Responsive Mode and Research Programmes. To ensure that research is fully utilised, funding for flexible knowledge exchange schemes is also supported. These funding mechanisms ensure that NERC investments clearly link to the strategic objectives in our strategy [Next Generation Science for Planet Earth 2007-2012](#).

## 3. Allocation of science budget split by strategic science themes



NERC strategic research is delivered through seven priority science themes to enable some of this century's critical environmental issues to be tackled. Theme action plans (TAPs) have been developed with strategic partnerships, setting out activities for delivering these themes. NERC's Council approved the second phase of the TAPs in November 2009, an investment of £96 million determining future Research Programme priorities. A total of £149 million across the two phases has now been allocated.

#### 4. Responsive Mode grants spend

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Spend on Responsive Mode grants <sup>1</sup>	£43.9m	£55.6m	£61.8m

<sup>1</sup> Does not include Responsive Mode studentship or fellowship spend.

Responsive Mode plays an essential role in sustaining the research base, providing opportunities for curiosity driven research to identify and address new research challenges and to train the next generation of researchers. It is a key element of NERC's strategy to promote unrestricted and innovative thinking to help identify the next generation of strategic priorities.

NERC is currently undertaking an evaluation of its Responsive Mode to assess the research achievements and collect evidence on how it has influenced NERC's strategy. It is expected that conclusions will be presented to NERC's Science and Innovation Strategy Board and Council later in the year.

#### 5. Funding into cross-council programmes

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>	<u>3 year total</u>
Spend on cross-council programmes <sup>2</sup>	£44.0m	£80.2m	£91.7m	£215.9m

<sup>2</sup> Includes LWEC research programme spend to date.

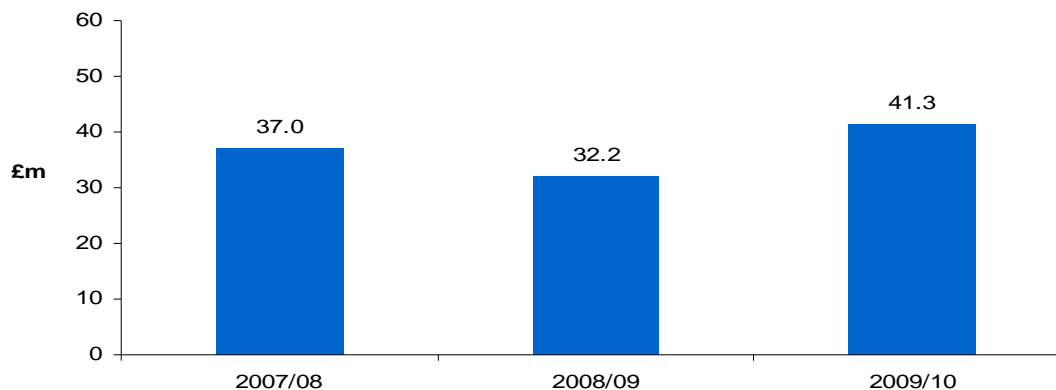
*By the end of the current spending review period the commitment to LWEC by NERC is estimated to be £237 million. Comprising of research programme spend plus additional contributions including those through NERC Research Centres and Responsive Mode.*

To confront many of the global environmental challenges research needs to take place across traditional boundaries. The NERC strategy, through the TAPs, underpins a multidisciplinary research approach.

The Research Councils fund and co-ordinate a number of major cross-council multidisciplinary research programmes with NERC contributing £215.9 million over the last three years, a major part of which being the Living With Environmental Change (LWEC) programme.

NERC continues to lead for RCUK the multi-partner LWEC programme, which aims to provide the knowledge and tools to enable society to make informed choices about the future. By 1 April 2010, 40 programmes had been launched under LWEC. It is estimated by the end of the current spending review period Research Councils will have committed £363 million to the programme, £237 million from NERC.

## 6. New Capital investment



*Draft figures, post audit. Earlier years figures have been amended so may differ to those reported in previous reports. Capital assets include such items as large scientific equipment, for example ships and Antarctic bases, small items of scientific equipment, underpinning services and facilities, estate of buildings that house Research Centres and facilities.*

NERC enables the UK to deliver world-leading environmental science through its National Capability (NC). This includes its expertise, data, facilities and equipment. During 2009/10, NERC invested £41 million in capital assets, receiving an additional £11 million from BIS for capital expenditure.

During 2010, NERC commissioned the building of a replacement ship for the ageing Royal Research Ship Discovery. The new research ship will provide a state of the art platform for researchers to address critical environmental issues.

Continued investment in NC is vital for maintaining our international standing in addressing key Earth system science issues and other priority areas of environmental science. It also enables NERC to assist responses to national and international environmental emergencies.

### **NERC research aircraft aids volcanic ash research**

NERC demonstrated its use of its National Capability when, in response to the massive plume of ash erupting from the Eyjafjallajökull volcano, its Dornier 228 aircraft was scrambled within 24 hours, soon followed by the joint NERC-MET office BAe 146. They continued to fly daily to sample aerosol and sulphur dioxide gas concentrations and to assess plume dispersion. Satellite images of the volcano were also prepared from data received from the NERC funded Satellite Receiving Station in Dundee and the plume of ash was tracked by NERC's National Centre for Atmospheric Sciences.

NERC's scientific data was fed into the Met Office forecast models to inform a rapid flow of information and knowledge to CAA and COBRA. Working with British Airways, Virgin and industry manufactures and using NERC science, these parties gathered data on the threshold for safe flying, enabling their decision-making about reopening UK airspace.

NERC has established the National Capability Advisory Group to advise on its long-term NC needs and NERC Council approved the first NC Action Plan in November 2009. This ongoing work will ensure that NC investments link closely to NERC's science challenges, strategic needs and priorities and that NERC infrastructure is flexible and responsive.

## 7. Review of NERC funded strategic facilities

During 2009/10 the Services Review Group recommended contract renewals for the two facilities considered: the NERC Biomolecular Analysis Facility (NBAF) for 5 years, and the Open University U-Series Facility (OUUSF) for 3 years.

Some of the positive comments received from the user community for the NBAF were: 'It is simply a wonderful resource, and surely the most efficient way to provide these sorts of things', 'State-of-the-art provision, approachable staff, excellent working relationships', 'Excellent student training', 'NERC and the UK are leading the provision of second-generation sequencing in Europe'.

Some of the comments received from the user community for the OUUSF were: 'The NERC OUUSF is a vital training environment for PhD students', 'The need for a NERC U-series facility remains essential if the UK is to remain competitive in the international science arena', 'As a previous user of the OUUSF, they have my full recommendation as a bidder for NERC facility status. In particular, I would like to stress the excellence of their analytical and data quality control.'

The Service Review Group is responsible for assessing services and facilities due for contract renewal. Membership of the group is convened annually with members drawn mainly from the Peer Review College, ensuring a majority of independent panel members. Facilities are assessed on need, uniqueness, quality of service and quality of science and training.

## 3.2. Knowledge Generation

Environmental science continues to grow in importance with the global challenges we are facing such as climate change and growing pressures on ecosystems. NERC funded researchers are continually adding to the global bank of knowledge. The sharing of this knowledge through publications and people flow is promoted and encouraged so these critical issues can be addressed in a multidisciplinary approach.

### 8. Number of Researchers

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Number of Principal Investigators receiving NERC grants <sup>1</sup>	1,059	1,063	1,064
Researchers employed by NERC <sup>2</sup>	1,174	1,147	1,186

<sup>1</sup> Based on PIs reporting on NERC's Research Outputs Database (ROD).

<sup>2</sup> Headcount of active researchers employed by NERC.

Whilst the total research spend has grown, the number of Principal Investigators (PIs) receiving NERC grants has remained steady over the past three years. The number of PIs provides a partial view of the number of individuals supported by NERC funded grants. Through its research centres NERC also directly employs over 1,100 active researchers focusing on NERC's strategic priorities.

### 9. Number of Masters students

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Total	371	362	382

*Masters includes MSc and MRes. Includes full and part awards.*

## 10. Number of PhD students

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
New	332	329	293
Total	969	988	1,017

*For wholly NERC funded studentships only.*

A strong supply of skilled people is important to the long-term health of the research base. NERC is committed to providing trained people to sustain environmental research and to meet the needs of stakeholders both within and outside the research base, through the funding of PhD and Masters students. Over the past three years, over 2,000 post-graduate students have been funded by NERC, ensuring the UK has a flow of highly skilled people, essential for economic growth.

For PhD and Masters courses, studentships are awarded to universities and NERC research centres. Institutions select students within set eligibility criteria. NERC actively monitors diversity; the current PhD stock is 52% female, with females making up 45% of Masters students in 2009/10. 2% of new PhD students are from ethnic minorities; however, 20% did not disclose ethnicity.

## 11. PhD submission rates

	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
% submitted within 5 years	90%	90%	88%	N/A
% submitted within 4 years	85%	88%	76%	80%

*Submissions within 5 years for PhDs starting in 2005 are not yet available.*

NERC is committed to a target of 80% of students submitting a PhD thesis within four years; most years this has been reached.

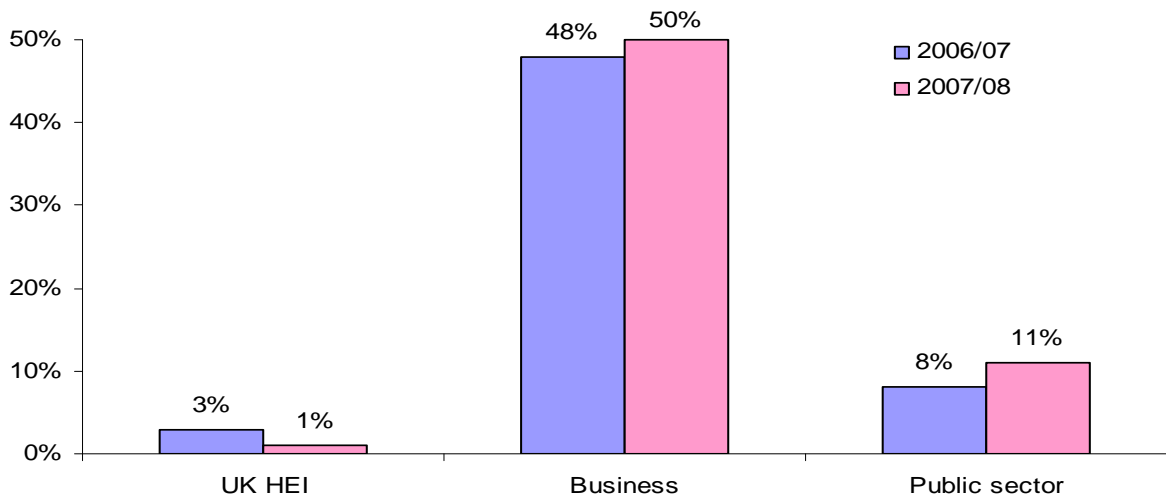
## 12. Number of Fellows

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Total	100	87	86

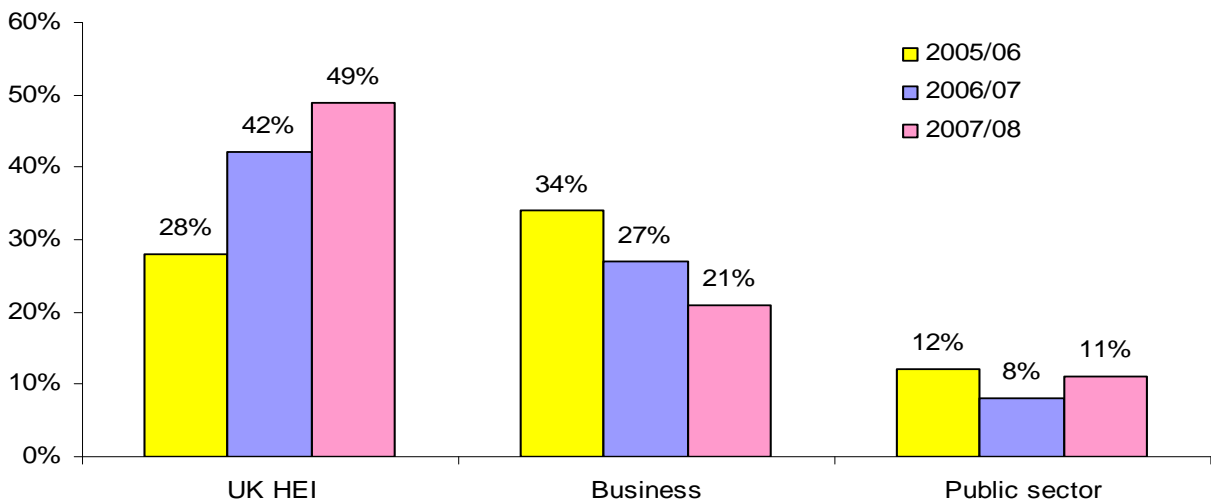
A major contribution to the health of disciplines is made through the NERC fellowship scheme. Fellowships are awarded to outstanding environmental scientists to undertake research to develop their research careers and produce work of international importance.

In addition to the main scheme NERC funds fellowship policy placements and supports the Royal Society industry fellowship, promoting the flow of people and knowledge between academia, policy and industry. Further examples of NERC's knowledge exchange work can be seen at Section 3.3.

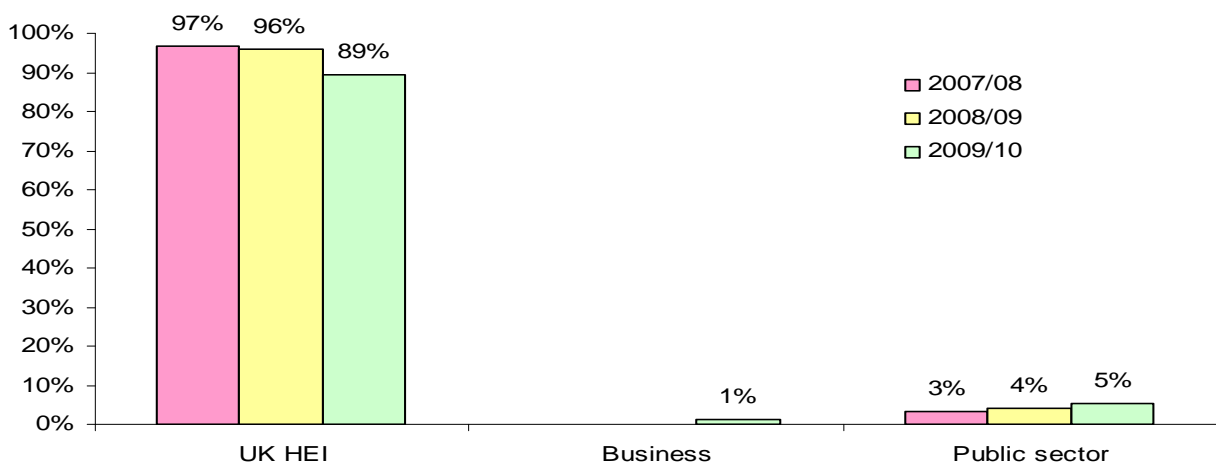
### 13. First destinations of NERC Masters students (HESA data)



### 14. First destinations of NERC PhD students (HESA data)



### 15. Destination of Fellows



The destination of PhD and Masters students is monitored through Higher Education Statistics Agency (HESA). Data is requested via HEIs from all postgraduate completers, giving a 70% return rate. NERC collects its own information on the pattern of destinations of its fellows.

With a proportion of PhD and Masters students choosing not to pursue an academic research career, but moving into the private and public sector, the economy derives a significant benefit from these students with scientific training.

A recent postgraduate skills needs review<sup>xi</sup> has identified the training priorities for the environmental sciences sector, helping to ensure that there are people with the right mix of skills and knowledge available to employers in the future.

## 16. Findings from evaluations of NERC research

During 2009/10 NERC commissioned independent economic impact case studies, these were undertaken by DTZ. These studies demonstrated the impact and value of specific research topics.

Examples from the studies are shown below; full details can be found at [Economic Valuation Reports](#).

### Modelling the UK in 3D

#### **Increase in groundwater extraction (£40 million)**

NERC's BGS models and associated software have been applied by the Environment Agency to support water extraction licensing in London. Better technical knowledge is critical to informed decision making. If an extra 10% groundwater abstraction can be licensed this would benefit the UK economy by £27-£40 million.

### Climate modelling and the re-insurance industry

#### **NERC safeguards jobs and UK industry (£7 billion)**

The UK insurance industry is the largest in Europe and the third largest in the world: it employs 313,000 people. Creating and exploiting new knowledge in fields such as catastrophe weather modelling helps maintain the UK's competitive position as a centre for reinsurance and supports the industry's growth in the future. NERC funding contributes to safeguarding and improving the £7 billion insurance sector to the benefit of the UK economy.

### Storm Surge

#### **NERC Modelling Safeguards Lives (£31 billion pa)**

In November 2007 the east coast of the UK experienced the worst storm surge for 20 years. Water levels due to tide and waves were accurately forecast two days ahead by NERC-funded predictive models. This prediction allowed agencies to operate the Thames Barrier and evacuate at-risk areas, so avoiding fatalities and significant financial loss. A similar storm surge in 1953 caused 307 deaths.

### Monitoring water quality in the UK

#### **Hydraclam (£60 million)**

NERC has supported the development of Hydraclam, a water monitoring device that helps water companies to monitor water supply in real time. Licensed to Siemens the product is projected to have cumulative revenues of £60 million from 2008-2016. NERC enabled the development through research, commercialisation and studentship funding carried out at the University of Manchester.

## 17. Citations: Number, world share and international comparative impact

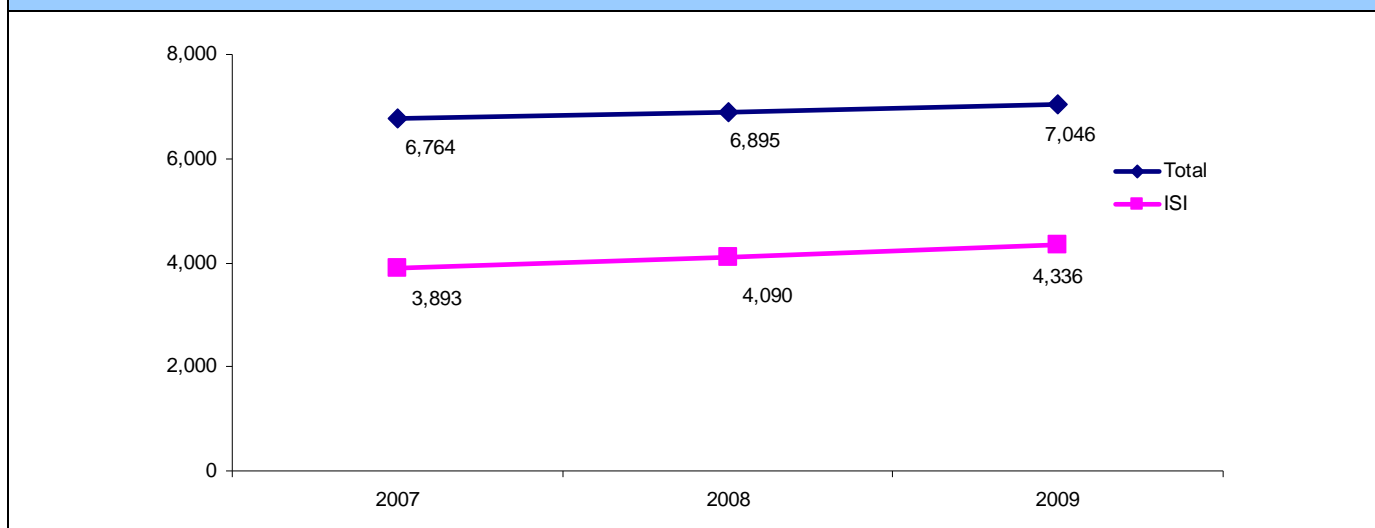
<u>UK environmental sciences</u>	<u>2003 - 2007</u>	<u>2008</u>
Share of world ISI journal papers	10.4%	9.5%
Rank within G8	2 <sup>nd</sup>	2 <sup>nd</sup>
Rank within Group of 26 countries	2 <sup>nd</sup>	2 <sup>nd</sup>
No. of citations received	61,296	5,459
Share of world citations	13.2%	13.6%
Rank within G8	2 <sup>nd</sup>	2 <sup>nd</sup>
Rank within Group of 26 countries	2 <sup>nd</sup>	2 <sup>nd</sup>
Citation impact score	1.27	1.43
Rank within G8	2 <sup>nd</sup>	1 <sup>st</sup>
Rank within Group of 26 countries	8 <sup>th</sup>	6 <sup>th</sup>

*Data extracted from a report by Evidence Ltd (now a group of Thomson-Reuters) for BIS on the [International Comparative performance of the UK research base](#), September 2009, pp. 26, 38 and 52; next report due in 2011. Five years data covering 2003 to 2007 averaged for consistency. 2008 data given to show trend, but more susceptible to annual variation.*

Much of NERC research is published in peer reviewed academic journals, quantifying the stock of publicly available knowledge and validating its quality. In 2008 UK environmental sciences progressed to achieve the highest citation impact score amongst the G8 nations, a score of 1.43.

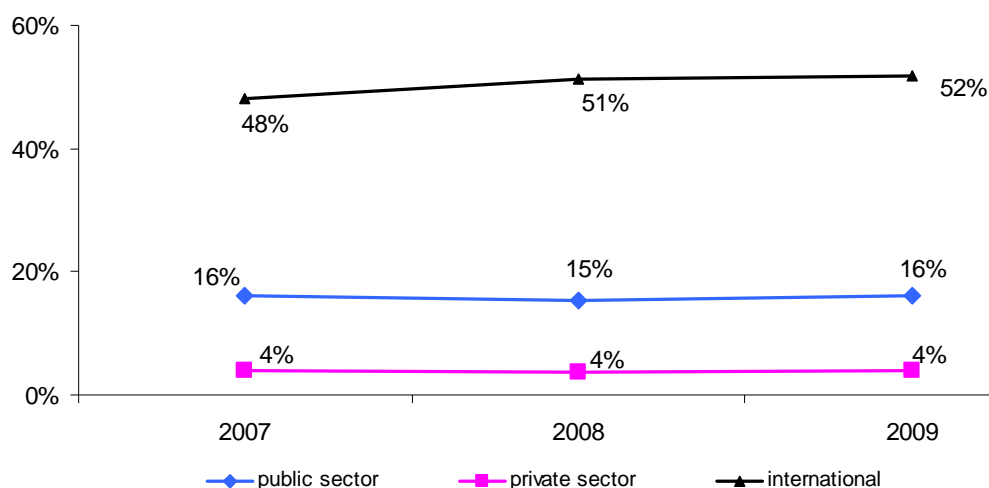
Thomson-Reuters data on NERC-funded research shows that 2.3% of NERC articles are outstanding, compared to 1% of world papers, where outstanding is defined as more than 8 times average citations impact.

## 18. Number of publications from NERC-funding



The number of publications from NERC funding has continued to increase to over 7,000 in 2009, with the number of articles published in ISI journals rising to 4,336, an increase of 6%. The proportion of publications in ISI journals has risen to 62% of the total in 2009, indicating, in conjunction with an increase in international co-authorship (see metric 19), that NERC is sustaining its high impact amongst the research community.

## 19. Co-authorship on NERC-funded ISI journal publications

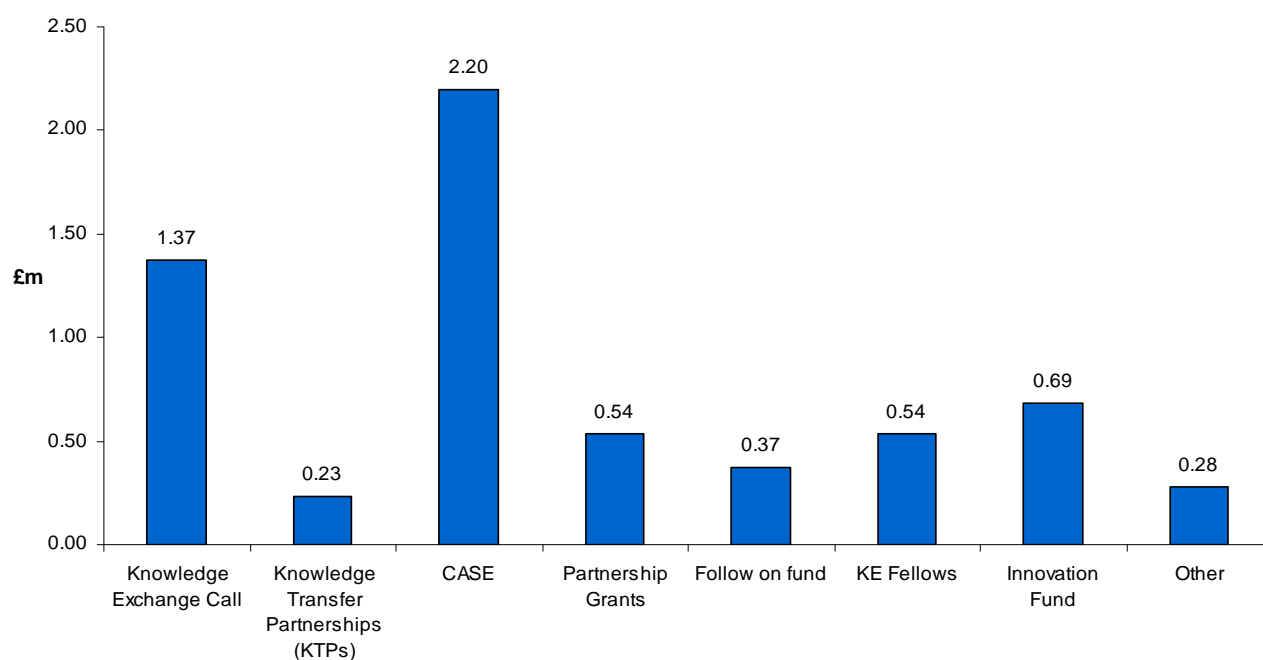


NERC encourages partnerships and collaborations to better understand the environment and to increase the impact of its research. The continued high level of co-authorship of ISI journal publications indicates sustained science quality..

## 3.3. Innovation Outputs and Outcomes

Making sure that NERC science is contributing to economic growth and wellbeing is an integral part of our business. The continual knowledge exchange (KE) between NERC, industry, policy makers and other key stakeholders is critical for achieving greater impact from the research we fund.

## 20. Knowledge exchange spend



*'Other' includes Connect A, Environment Young Entrepreneurs Scheme (YES), KE systematic reviews, Royal Society Fellowship and Policy internship and placements schemes.*

NERC has developed a user led knowledge exchange strategy to maximise the transfer of knowledge and commercialisation of research. Over £6 million was spent on specific KE activities including training, knowledge flows and commercialisation during 2009/10.

NERC is playing a pivotal role in the rapidly emerging green economy. We have outlined plans to work with business and policymakers, with a focus on five priority areas of impact where research capabilities match the needs of the wider economy:

- Marine renewable energy
- Water security
- Resource management (including, for example minerals, forests, waste)
- Environmental management for food and agriculture
- Financial services risk management and valuation

Focusing our resources in these key areas will lead to strengthened engagement with business, enhancing the take up of knowledge that enables industries to more effectively adapt to environmental change, and to respond to opportunities presented by the low carbon economy, a priority for the UK.

<b>21. Co-funding</b>			
	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
External funding for Research <sup>1</sup>	£33.4m	£35.2m	£39.1m
Funding received from other bodies	£8.2m	£6.5m	£10.9m
<b>Total</b>	<b>£41.6m</b>	<b>£41.7m</b>	<b>£50.0m</b>
<i>Co-funding reflected through NERC Accounts.</i>			
<i><sup>1</sup> External funding to meet the cost of contract research carried out by NERC's research centres.</i>			

The international excellence of NERC research acts as a magnet for foreign investments. For example, over the current spending review period NERC has secured new co-funding commitments of at least £25.5 million from US funding agencies, through NERC's RAPID Watch and other NERC research programmes. This kind of co-funding is supplementary to funding reported in the NERC accounts.

Preliminary data indicates that UK researchers secured the largest proportion (€28 million) of funding for environmental research from the Environment Theme of the European Commission's Framework Programme. This highlights how NERC research plays a key role in making the UK an attractive partner in which to invest.

NERC also promotes collaborative research activity through its Partnership Grant scheme. This scheme supports joint research between academic researchers and public or private sector partners. The popularity of this scheme with users has led to a more than doubling in its funding over the last two years.

<b>22. Number of patents filed</b>			
	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Number of patents filed	10	7	11
<i>Patents arising in HEIs may not have been reported to NERC.</i>			

The results of NERC research has led directly to the development of new products and services for business and industry. NERC continues to investigate commercial opportunities as a key element of its KE strategy, developing innovation routes to markets to maximise the impact and benefits of NERC science.

NERC is working closely with Technology Strategy Board (TSB) to increase business interaction and generate the opportunities for the application of NERC science.

#### Commercialisation of Research

Research on how ticks feed on their hosts' blood has led to the development of a new anti-clotting drug called Variegin. This could help prevent strokes or heart attacks. Patent applications have been filed and the drug is helping create a new spin out company, IXO.

### 23. Income from contract research and intellectual property

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
External funding for research <sup>1</sup>	£33.4m	£35.2m	£39.1m
IP income: <i>Royalties and licences</i>	£2.8m	£2.2m	£1.9m
IP income: <i>Software and data sales</i>	£2.0m	£2.2m	£3.0m
<b>Total</b>	<b>£38.2m</b>	<b>£39.5m</b>	<b>£44.0m</b>

<sup>1</sup> External funding to meet the cost of contract research carried out by NERC's research centres.

Contract research is a powerful enabler of knowledge exchange. Building strong links with partners, NERC continues to support and grow this activity through its network of research centres.

NERC-funded researchers are making greater efforts than ever before to share their expertise with the public. Data collected by NERC provides a unique and irreplaceable record of the environment and is a valuable resource for users in academia, the public sector and industry. Often data is made available at no cost so sales income gives only a partial picture of the value of data exchanged.

#### Open Data

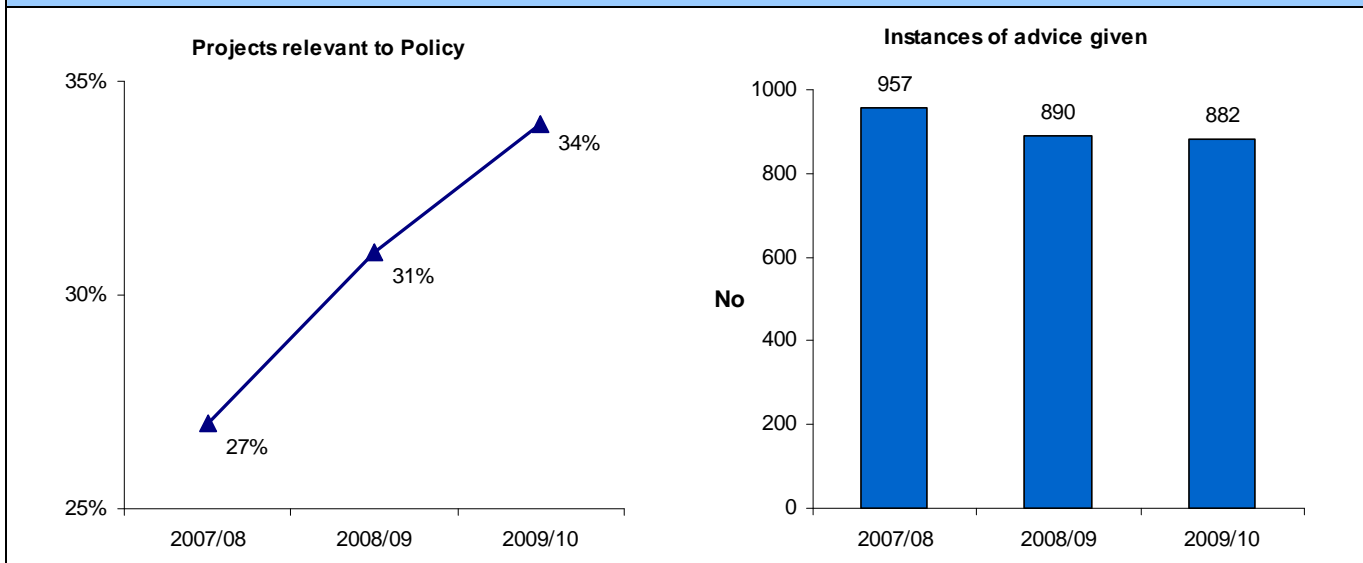
BGS's OpenGeoscience website provides high-quality geological maps, data and images free of charge over the internet. The website lets people look at their area's geology at street-level. It has already attracted many millions of visitors.

### 24. External representation on major NERC policy and strategy bodies

	<u>Academia</u>	<u>OGD/NDPB</u>	<u>Business</u>
Council	53%	18%	18%
Science and Innovation Strategy Board	63%	19%	6%
Audit Committee	25%	0%	75%
National Capability Advisory Group	43%	14%	14%
<b>Total</b>	<b>51%</b>	<b>16%</b>	<b>18%</b>

An important aim of the KE strategy is the presence of users on NERC's advisory and decision making boards. As at the end of March 2010, 85% of members on NERC's major policy and strategy bodies were from organisations external to NERC, providing valuable input to the decision making process influencing NERC's strategy and priorities.

## 25. Science to policy



NERC scientists continue to influence UK and global policy making, for example through contributions to the assessment reports of UK Inter-governmental Panel on Climate Change (IPCC), contributing much of the evidence that informed discussions at Copenhagen and a major contribution to the new Marine and Coastal Act. Further examples are reported in the [NERC Economic Impact Baseline](#).

### Influencing air quality policies

NERC provided vital evidence to the parliamentary Environmental Audit Select Committee inquiry on air quality, that air pollution could still be contributing to as many as 50,000 deaths per year, despite significant reductions following the introduction of previous policy changes informed by NERC research. Air pollution makes asthma worse and exacerbates heart disease and respiratory illness. NERC's CEH has been commissioned to undertake further research to inform future policy.

The proportion of NERC funded projects that have given policy advice has continued to rise with 34% giving advice during 2009/10, a 26% growth over two years. NERC has also provided advice for 22 consultations and 7 inquiries. NERC has helped inform government policy on topics including regulation of geoengineering and securing food supplies, critical UK and global issues.

Through its KE training schemes, policy placements and secondments NERC is working to strengthen the skills base and to facilitate the translation of environmental science into public policy.

*'During the course of the placement I have been able to significantly develop my portfolio of professional skills. I have also learnt an incredible amount about the legislative process of the Scottish Parliament, the Houses of Parliament in Westminster, and European Union. These skills and knowledge will be invaluable in the future whichever career path I pursue.'* - Gordon Lawrence, Cardiff School of Earth and Ocean Science.

*'I finished the Scheme with heightened respect for the very difficult job done by MPs. I understand much more clearly now the intricacies of the political decision-making processes. Overall, the MP-Scientist Pairing Scheme has been very beneficial to both the MP and the scientist, and I would not hesitate to recommend it to other eligible NERC scientists.'* – Paul Williams, NERC Fellow.

## 3.4. Public Engagement

Public engagement enables people to consider, question and debate science issues and to be inspired by and understand the benefits that science brings to society. The relevance of NERC science to people's lives provides a strong platform for public engagement.

The NERC Public Engagement with Research (PER) strategy, approved by Council in 2009, will be delivered through a mix of NERC and RCUK activities. It includes both one-way communication and two-way dialogue strands and is targeted right across society to engage as large a section of the public as possible.

### 26. Funding for public engagement activities

	<u>2007/08</u>	<u>2008/09</u>	<u>2009/10</u>
Target for funding for PE activities <sup>1</sup>	£1.23m	£1.25m	£1.22m

<sup>1</sup> *Public engagement target spend – this includes spend within NERC research centres. PE is not delivered in isolation; this means it is not possible to separate out the different strands of spending.*

NERC's PER strategy recognises that much excellent public engagement work is already carried out by the wider NERC community. Public engagement cannot be carried out in isolation and often overlaps with stakeholder engagement and knowledge exchange activities. Over the last three years the target for public engagement spend has remained steady at around £1.2 million each year.

The NERC PER strategy is closely aligned to the RCUK PER strategy. The Research Councils together funded £2.5 million of public engagement initiatives through the RCUK Public Engagement with Research (PER) team in 2009/10.

Reflecting the RCUK approach, the NERC PER strategy has four aims:

***Aim 1: Work with the public to foster debate and identify attitudes to environmental issues to be considered in the conduct of research and in deciding research priorities.***

NERC has carried out a public dialogue on geoengineering, the results of which informed a workshop held by EPSRC and will be used in informing development of NERC's research strategy. Additional information relating to this can be seen in metric 28.

***Aim 2: Engage young people with environmental research to encourage the uptake of environmental science as a research career and to ensure more informed citizens.***

A number of short video clips have been produced in which researchers talk about their work and the A-level choices they made that enabled them to follow a career in environmental science. NERC worked with the Parliamentary Office of Science and Technology (POST) education department to develop and deliver a youth parliament debate for 13-15 year olds discussing current biodiversity loss and how moral and practical issues might be considered in tackling this.

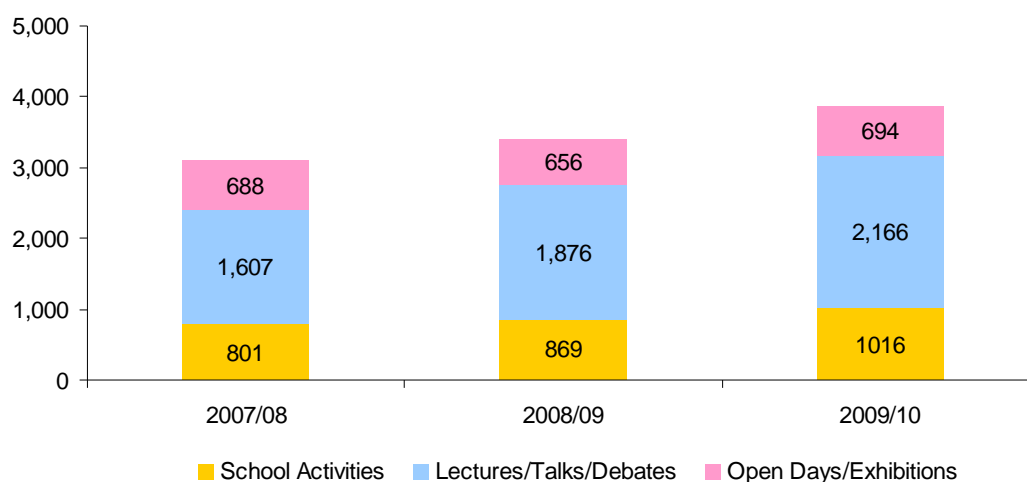
***Aim 3: Encourage and enable NERC-funded scientists to engage with the public and undertake public engagement activities that link science and society, and support and reward those that do so.***

Support for science festivals, exhibitions, events and school visits has enabled NERC-funded scientists to engage with the public in discussion about their research. Key to this is the provision of in-house training courses for scientists about how to communicate their science to a wide range of audiences. Further examples can be seen in metric 27.

**Aim 4: Increase public awareness of NERC-funded research, and the impacts that flow from it.**

NERC-funded research is widely reported through popular media. Examples of stories covered in the past year include 'Banded Brothers: The Mongoose Mob' which was on prime time BBC TV, 'Ice retreat creates a new CO<sub>2</sub> store', covered by the BBC website, and BGS's role in understanding the impact of the Haitian earthquake, which was covered by most mainstream press. Further examples can be seen in metric 27.

**27. NERC public engagement events**



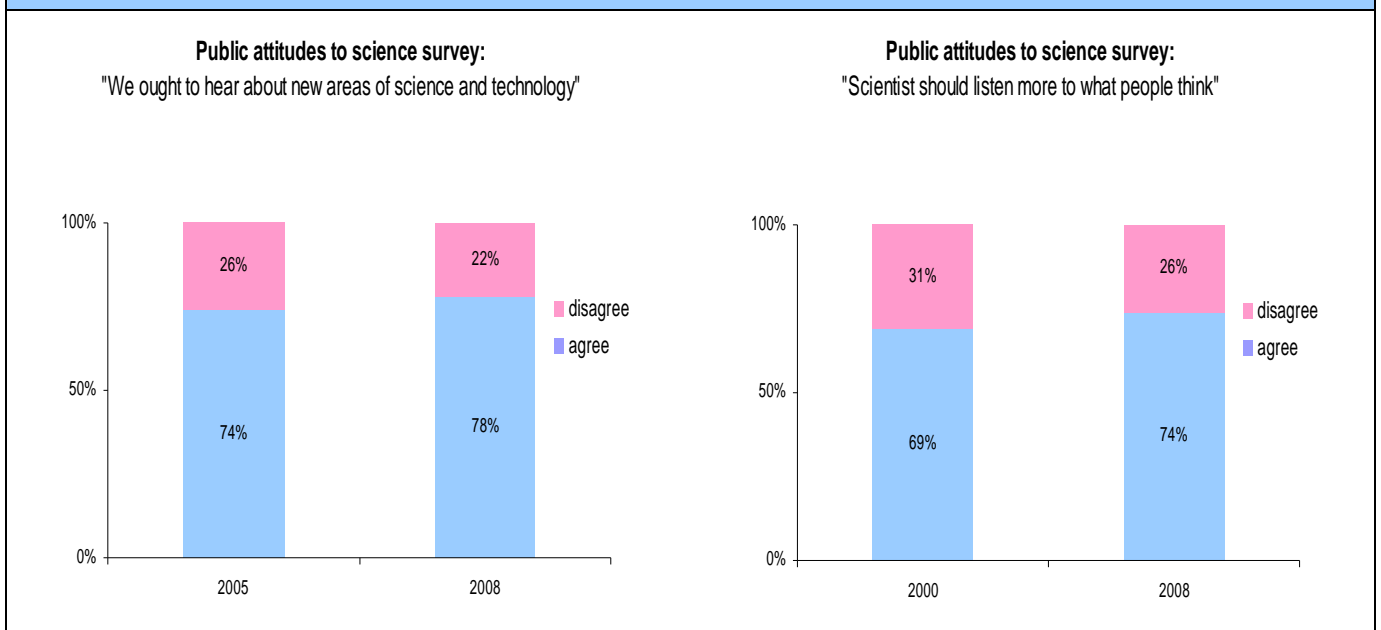
NERC continues to promote the importance of engagement between the research community and the public. This is indicated by the growth of 25% in public events in two years.

One key way of increasing public awareness of NERC-funded research is through the use of Planet Earth Online. In September 2009 the Planet Earth Online podcasts were relaunched as longer fortnightly podcasts in the style of a radio programme, to increase the listener base and compete with other science podcasts. Since the relaunch there has been a doubling in podcast page views, and at times up to three times the previous number. Traffic to Planet Earth Online continues to increase, with average monthly page views of 32,000, an increase of 7,000 page views per month on the previous year.

The Harlequin Ladybird survey, launched in 2005 as a joint venture between CEH, the University of Cambridge and Anglia Ruskin University, continues to grow in popularity. In July 2009 there was a stand at the Royal Society Summer Science exhibition that coincided with the launch of a biological recording portal for mobile phones supported by Woolworths. This enables the public to use their mobile phones to upload their observations. Public involvement in reporting sightings of this invasive ladybird is crucial to developing an understanding about how it spreads and may help identify vulnerabilities that could be exploited to keep it in check. The harlequin ladybird survey was featured twice on the BBC's Autumnwatch.

A full list of the NERC organised events can be found at <http://www.nerc.ac.uk/events>.

## 28. Survey trends in public attitude to science issues



The public attitudes to science survey indicates that a high proportion of people felt that new areas of science and technology should be discussed with the public and scientists should listen to the public.

To consider the ethical, moral and social implications of geoengineering NERC launched a public debate in February 2010, the results will inform future research directions.

As part of the public engagement activities it also held an evening event at the Science Museum, London. A varied programme of talks, comedy, debate, demonstrations and hands-on activities was designed to introduce different aspects of geoengineering and to allow interaction with the scientists involved. NERC funded scientists took part in the event, which attracted over 2,000 people.

## Annex A: References

<sup>i</sup> A framework for the development of clean coal:

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<sup>ii</sup> Future values of Carbon Abatement Technologies in Coal and Gas Power Generation to UK Industry, AEA March 2010:

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<sup>iii</sup> <http://www.geos.ed.ac.uk/sccs/regional-study/CO2-JointStudy-Full.pdf>

<sup>iv</sup> Energy Security: A national challenge in a changing world

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<sup>v</sup> <http://www.free-uk.org/pdf/science-plan.pdf>

<sup>vi</sup> Flood Estimation Handbook:

<http://www.ceh.ac.uk/Feh2/fehintro.html>

<sup>vii</sup> Pricewaterhouse Coopers LLP 'Economic benefits of environmental science'

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<sup>viii</sup> DTZ report 'Modelling the UK in 3D'

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<sup>ix</sup> <http://www.parliament.uk/documents/post/postpn348.pdf>

<sup>x</sup> Water Resources Strategy for England and Wales

<http://publications.environment-agency.gov.uk/pdf/GEHO0309BPKX-E-E.pdf>

<sup>xi</sup> Most Wanted: Skills Needs in the Environment Sector, ERFF Report 7 (2010)

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