Response from the Natural Environment Research Council (NERC)
To the Department for Business Energy and Industrial Strategy (BEIS)
On the Green Paper consultation: *Building Our Industrial Strategy*

Introduction

1. The Natural Environment Research Council (NERC) is one of the UK's seven Research Councils. We invest in cutting-edge research, postgraduate training and innovation in universities and research centres. Our science explores the physical, chemical and biological processes on which our planet, life and our economy depends – from safe food and water to energy and minerals, from air quality and flooding to long-term changes in our environment and climate. We work in partnership with business, government, civil society, the public and researchers: (1) to shape the environmental research and innovation agenda; (2) to provide the knowledge, skills and technology for a resilient and productive economy, and for public wellbeing.

2. NERC greatly welcomes the Government's Green Paper *Building our Industrial Strategy* and the £4.7bn additional investment outlined in the Green paper and in the Chancellor's Autumn Statement. NERC is working with our partners, in UK Research and Innovation (UKRI)[1] and beyond, to make the UK the best place in the world to research, innovate and grow business. It is now well established that public investment in R&D stimulates private investment and drives growth[2]. Hence we welcome the Green Paper's recognition that an advanced economy benefits from long-term government investment in excellent science, research and innovation. Such investment is akin to investing in skills and infrastructure – it is a horizontal or general purpose intervention that supports the whole economy, benefits all on a non-discriminatory basis, and underpins sectoral interventions.

3. NERC has contributed to, and supports the Research Councils UK response to this consultation. In our own NERC response we focus on issues most relevant to the environmental science domain. We offer overarching recommendations concerning the draft Industrial Strategy as a whole, and then address some of the specific questions posed in the Green Paper consultation.

NERC's overarching recommendations are for the Industrial Strategy to:

1. Encourage and enable the full spectrum of the UK's research and innovation base to engage with each and every pillar to deliver the Strategy's vision and challenges.
2. Recognise that our economic growth depends on the natural environment.
3. Recognise that environmental science brings the intelligence and innovation to achieve economic outcomes that span the whole Industrial Strategy and all its pillars – for example in providing for **clean growth**, a **resilient economy** and **productive regulation**.

[1] Subject to the Higher Education and Research Bill gaining Royal Assent.
[2] Views from the PM's Council for Science and Technology. NERC Impact Reports provide examples: NERC Impact Report 2016

Overarching recommendations

Enabling the UK's world-leading research base to engage with, and deliver, the Industrial Strategy

4. The role of UKRI and its Councils now is to challenge and mobilise our world-leading researchers[3] to contribute more strongly than ever to the UK's economic success. Pillar 1 of the draft Industrial Strategy recognises the enabling role of research in providing a broad spectrum of knowledge for innovation and growth. Other pillars pay less attention to research and focus more on the role of technology development. Addressing the challenges identified in each pillar will require a combination of research, innovation, business, policy and societal responses. This is more likely to be achieved if researchers across all disciplines can more readily see and identify with opportunities to engage with all the pillars and challenges in the Strategy.

5. To enable this **we recommend the Industrial Strategy explicitly encourages and enables the full spectrum of the UK's research and innovation base to engage with each and every pillar to deliver the Strategy's vision and challenges**.

Productivity and growth depend on the natural environment

6. Our economy and the natural environment are inseparable. Every business and every consumer benefits from natural resources (for example, minerals, energy, water and food) while incurring the costs of environmental hazards, pollution and degradation. **We recommend the Industrial Strategy explicitly recognises the dependency of our economy on the natural environment** as it directly enables, and can limit, productivity and growth across all pillars of the draft Strategy.

7. In economic terms, the natural environment provides material inputs and services that are essential for economic activities, whilst in turn the outputs of economic activities can degrade both the environment (for example, through over-exploitation or pollution) and the health of the workforce (the labour element in economic models). Hence, alongside capital and labour, environmental factors strongly influence total output and productivity growth, in the short and long terms.[4] Governments and businesses worldwide now recognise that integrating economic, environmental and social considerations delivers stronger economic outcomes in terms of productivity, innovation, employment, balance of trade, resilience and other benefits.[5]

8. To give some idea of the scale of economic dependence on the environment, the global value of beneficial services we derive from the environment ('ecosystem services') is estimated in tens of trillions of pounds, accounting for more than half of total world output.[6]

9. As an example of the opportunity for growth based on environmental innovation, UK environmental goods and services contributed £29 billion GVA in 2014 and supported 373,000 jobs. Output was £61

[3] UK environmental science leads the world on excellence, ahead of the USA and other comparator nations
[4] Bowen, A (2016) Long-term productivity growth and the environment. *OECD Environment Working Papers,* No. 102, OECD Publishing, Paris.
[5] World Economic Forum (2014) World Scenarios Series: The Future Availability of Natural Resources – a new paradigm for global resource availability. International Chamber of Commerce (2012) Green Economy Roadmap. Rayment et al (2009) The economic benefits of environmental policy: ENV.G.1/FRA/2006/0073 – 2nd. Final Report.
[6] Bowen, A (2016) Long-term productivity growth and the environment. *OECD Environment Working Papers,* No. 102, OECD Publishing, Paris.

billion, with growth of 18.7% from 2010 to 2014.[7] And the UK is already an exporter of environmental goods and services, with competitive advantage to increase our share of growing global markets valued between $1 trillion and $2.2 trillion.[8] While other nations, such as China, make huge investments in environmental projects, it is important for the UK to remain a net exporter, rather than importer, of environmental science, skills and services.

The contribution of environmental science, technology and skills

10. Above we argue that a modern Industrial Strategy should explicitly recognise the critical importance of the environment for the UK economy. It follows that environmental science, technology and skills are therefore essential to support the whole economy. Environmental science already drives productivity, international trade, jobs and growth in every sector[9] and in every region of the UK[10]. Below we illustrate how it offers even more to HMG Industrial Strategy.

11. In short, environmental science, technology and skills enable business, government and society to:

    (i) Safely find and secure raw materials, harvest renewable resources, and re-use or return our waste to the environment.

    (ii) Invest in infrastructure, businesses and jobs that are resilient to current and future environmental shocks – in the UK and across our global supply chains.

    (iii) Maximise the benefits versus costs of new technology and innovation – across whole systems and life-cycles of products, services and economic development.

    (iv) Reduce the costs to business and government of environmental regulation and subsidies.

    (v) Support a healthy and productive environment and workforce.

    (vi) Reduce reputational risks, and win public consent, through environmentally responsible investment, innovation and operation.

12. This means that environmental science brings the intelligence and innovation to achieve economic outcomes that span the whole Industrial Strategy and all its pillars – for example, providing for **clean growth**, a **resilient economy** and **productive regulation**.

Clean growth

13. Achieving clean growth is a challenge for the whole economy, across all sectors of industry and the environment. The draft Industrial Strategy recognises the need for transition to a low-carbon, energy-efficient economy with reduced CO_2 emissions. Other sources of pollution also impose costs and reduce productivity. UK air pollution causes 29,000 premature deaths annually, reduces agricultural yields, and damages buildings and the environment. Environmental science played a vital role in successful UK and international regulation of ozone-depleting chemicals, airborne nitrogen and sulphur (acid rain), heavy metals and persistent organic compounds (including some

[7] Office for National Statistics (2017) Statistical Bulletin: UK environmental goods and services sector (EGSS) 2010-2014. EGSS activities include management of, and consultancy services for: waste, renewable energy, water, floods, air and soil. EGSS-intensive industries include agriculture, manufacturing, energy, water, construction, wholesale and retail trade.

[8] Environmental Industries Commission (EIC) Corporate Plan 2017-2019 ($1trillion). Rayment et al (2009) The economic benefits of environmental policy: ENV.G.1/FRA/2006/0073 – 2nd Final Report ($2.2trillion).

[9] NERC Impact Report 2015

[10] More than 70% of NERC funding is invested outside London and the South East

pesticides).[11] For clean growth based on a healthy environment, the opportunity now is to tackle contemporary pollution challenges – such as nitrogen and phosphorous in soil and freshwater (from agricultural fertilisers) and airborne particulates in our cities (from agriculture and transport emissions).

14. The UK has the world's largest capacity for offshore wind energy[12], 50% of Europe's tidal energy[13] and 35% of Europe's wave energy, together with world-leading capability in environmental impact monitoring. Markets for renewable energy services are growing around the world, notably in Asia and the USA. Environmental science innovations in impact monitoring have already enabled government licensing and reduced operating costs for offshore renewable energy in Scotland, Northern Ireland and northern England.[14] The UK also has huge potential for geothermal, nuclear and shale gas energy, carbon capture and waste storage, together with world-leading capability in visualising underground geology. UK industry is eager for environmental science and technology – for example to safely store waste underground and to develop robotic undersea vehicles, originally designed for marine research, to safely and cost-effectively survey, maintain and decommission offshore energy and communications infrastructures.

15. Providing safe and affordable food for a growing population is a significant challenge in the UK and globally. The UK agri-food industry contributes £108 billion (6.8% of national GVA in 2014) to our economy, employs 3.9 million people (13.5% of UK jobs) and generates £18 billion in exports (2015).[15] Environmental science innovations enabled Scottish salmon farming to grow to £650 million, generated £331 million benefit to shellfisheries in Scotland, Wales, Northern Ireland and SW England, and created spin-out companies in food testing and food waste.[16] The UK supports a number of research and innovation platforms in sustainable agri-food, led by major businesses across the supply chain from farm to fork.[17] Now is the time to grow the UK food industry through innovation to enhance food safety and productivity, increase resource efficiency (for example, use of limited or expensive land, water, chemicals) and reduce impacts (for example, nitrogen pollution, greenhouse gases).

16. Manufacturing companies face increasing costs of raw materials and energy, coupled with higher expectations from customers and investors on their environmental performance. Large companies like Boeing, Rolls Royce, Honeywell and Tata Steel are dependent on environmental science information to plan the supply of, often rare, minerals needed for manufacturing. And a university spin-out integrates information on materials into computer-aided design tools so that manufacturers can boost resource efficiency.[18] Now the UK could help SMEs, which are often constrained by cost pressures and lack of knowledge, to access environmental innovation and seize opportunities for resource efficiency and clean growth.[19]

Resilient economy

17. Business, trade and essential infrastructure are at risk from environmental and climate hazards – in the UK and across our global supply chains. Meanwhile government and the private sector are

[11] NERC Impact Report 2016
[12] Offshore Wind Energy
[13] https://www.gov.uk/guidance/wave-and-tidal-energy-part-of-the-uks-energy-mix
[14] Food statistics pocketbook 2014 and Food statistics pocketbook 2015
[15] Food statistics pocketbook 2016
[16] NERC Impact Report 2014 and NERC Impact Report 2016
[17] For example: Sustainable Agriculture Research and Innovation Club N8 Research Partnership: Agrifood
[18] NERC Impact Report 2014
[19] OECD Sustainable Manufacturing toolkit

investing massively to upgrade infrastructure as a universal enabler of productivity and growth for the whole UK for generations. Driven by regulation (for example, Climate Change Act) and environmental risks, investors require low-carbon infrastructure that is resilient to future climate (for example, extreme heat, wind, floods and drought)[20].

18. Environmental science provides intelligence on future climate risks and design standards – for example to defer the £billions cost of replacing the Thames Barrier prematurely[21], or to decide where to locate essential transport and energy infrastructure. Engineering consultancies, transport networks, energy and water companies constantly look to innovation in environmental science to guide risk assessment, investment, design and operation of the UK's essential infrastructure.

19. The UK is an international centre for the insurance and reinsurance industry, worth £29 billion a year to the UK economy. Storms cause more than half the risk to the sector, costing $18.4 billion in global insured losses in 2014. Environmental science is helping UK-based insurers understand and price environmental and climate risks, and transform their business models, saving £130 million annually.[22] Environmental science also saves homes, businesses and infrastructure by providing the Met Office, UK Flood Forecasting Centre, local and central government with accurate and earlier flood predictions. In the winter 2013/14 floods one million properties were protected and 50,000 fewer flooded, saving £2 billion in insurance pay-outs and £2.6 billion in lost working.[23]

20. By 2050 two-thirds of the world's population will live in urban areas. The global stock of infrastructure is expected to double by 2025. Mega-cities will proliferate and the global market for 'smart city' environmental services is estimated at $750 billion. The UK is well placed to capitalise on the opportunities this presents our world-leading science and business.[24] Countries like China and India are already major partners for UK environmental science expertise, for example in water and air pollution, water resources and waste management. Now we can provide the knowledge and skills for UK business to export environmental goods and services.

Productive regulation

21. Environmental regulations, standards and subsidies are necessary for a healthy economy and a healthy environment. Regulation is a major driver of innovation and investment, but also of costs for business and government[25]. Estimated expenditure by UK industry on environmental protection in 2013 was £2.7 billion[26]. Many current, especially EU, environmental regulations are based on potential hazard rather than actual risk, and so adopt the precautionary principle and impose constraints on the economy. Rapidly advancing environmental science enables a more selective risk-based approach to focus interventions where they have most benefit and avoid unnecessary costs of compliance.

22. In the UK water industry, for example, environmental science has improved regulation so that the benefits of clean water outweigh the costs of compliance by £5.5 billion and saved water companies

[20] The infrastructure needs of a low carbon economy prepared for climate change
[21] NERC impact report 2014
[22] NERC impact report 2015
[23] NERC impact report 2014
[24] Views from the PM's Council for Science and Technology and Smart cities market
[25] Corporate investments and environmental regulation, EMJ, Vol 35, Issue 1, Feb 2017. And Horbach J, Rammer C and Renning K (2012) Determinants of Eco-innovations by Type of Environmental Impact – The Role of Regulatory Push/Pull. Ecological Economics, vol. 78, pp 112-122.
[26] Environmental Protection Expenditure by Industry: 2013 UK Survey

£7 billion in unnecessary EU compliance schemes.[27] In the marine environment, environmental science boosted UK economic growth by informing a ban on harmful chemicals used to protect ships hulls – the benefits to UK shellfish production, fishing, diving and marine services outweighed the costs of compliance by £908 million.[28] Accurate scientific definition of environmental disturbance saved the UK taxpayer £6 billion in unnecessary compliance costs under the EU Urban Waste Water Treatment Directive.[29]

23. Exiting the EU provides once-in-a-generation opportunities to simplify environmental regulation, provide joined-up incentives, promote investor confidence, enable resource efficiency and drive up productivity – all based on sound environmental science. And the UK can lead international standards to give our companies competitive advantage in global markets. For example new benchmarks for transparent measurement of company carbon performance have already been taken up by the supermarket and mobile telecoms sectors, and by the Carbon Disclosure Project involving more than 90 global investors managing £7 trillion of assets.[30]

[27] NERC Impact Report 2016
[28] NERC Impact Report 2016
[29] NERC Impact Report 2015
[30] NERC Impact Report 2015

NERC responses to selected consultation questions

PILLAR 1: Investing in science, research and innovation

Q5: What should be the priority areas for science, research and innovation investment?

Q6: What challenge areas should the industrial strategy challenge fund focus on to drive maximum economic investment?

Q8: How can we best support the next generation of research leaders and entrepreneurs?

Q9: How can we best support research and innovation strengths in local areas?

24. Government investment in science, research and innovation has long recognised the need to achieve international competitiveness through a balanced investment portfolio that supports:

    (i) Challenge-led activities – to address specific needs of the economy, business, society.

    (ii) Fundamental discovery – to generate new knowledge, unforeseen breakthroughs and disruptive innovation.

    (iii) A healthy research base across the breadth of disciplines – because ideas and innovation spillover between disciplines, and because multiple disciplines are needed to solve major business and societal challenges.

25. The creation of UK Research and Innovation (UKRI) brings new opportunity to map the whole UK research and innovation landscape, develop coherent cross-cutting priorities, and respond with agility to new challenges.

26. There is broad global consensus around the key challenges facing society and the economy that governments should focus on. For example the Council for Science and Technology identifies healthy lives, cities and transport and clean energy[31], while the UN Sustainable Development Goals offer a comprehensive perspective[32]. The need to solve these challenges drives invention, innovation and entrepreneurship, and creates new economic opportunities and markets. Hence, while recognising the balanced funding principles articulated in paragraph 24 above, the Industrial Strategy Challenge Fund (ISCF) should focus on helping researchers and businesses rise to major societal challenges.

27. For enduring competitive advantage, international leadership and growth, selection criteria for ISCF priorities should be able to recognise potential long-term, large-scale growth opportunities – including markets that cannot yet be readily quantified – and resist the temptation to focus narrowly on known or readily quantifiable short-term market opportunities.

28. The draft Industrial Strategy recognises that advanced skills are vital for the UK economy, and doctoral graduates boost innovation and growth, yet businesses are constrained by shortages of skilled staff. New investment should therefore grow the volume of doctoral training, target advanced skills needed by employers, and support tomorrow's top leaders for business and research (see Pillar 2 below).

[31] Views from the PM's Council for Science and Technology
[32] UK Sustainable development goals

29. NERC invests in the most excellent research and innovation projects in research organisations – HEIs and research institutes – in localities across the UK[33]. Research organisations are key players in local innovation clusters, working with LEPs, business and local government to drive local economies and jobs (see Pillar 10 below). Through UKRI we can do more to join up the entire research and innovation landscape, to align and target different funding sources to support local clusters, and to enable businesses to access world-class research and innovation from anywhere in the UK (which is a small and increasingly well-connected country).

PILLAR 2: Developing skills

Q13: What skills shortages do we have or expect to have, in particular sectors or local areas, and how can we link the skills needs of industry to skills provision by educational institutions in local areas?

30. In addition to technical skills, businesses need the advanced skills that doctoral graduates contribute – such as the ability to identify, adapt and integrate new technologies[34]. Doctoral graduates generate economic benefits whether they remain inside research (adding to the supply of new knowledge and technology for innovation) or work in industry enhancing its capacity to absorb knowledge and stimulate demand for innovation (more than 50% of doctoral graduates work outside academia 5-7 years after graduation)[35]. Environmental science doctoral graduates are highly valued and employed across the economy in a wide range of industry, policy and charity sectors[36].

31. Research Councils work with industry and government to identify and deliver the skills they need through Centres for Doctoral Training (CDTs)[37], and develop world-class business and research leaders through independent fellowships.

32. UK industry has identified more demand for advanced skills than Research Councils can currently support[38]. Employers face challenges attracting and retaining the best talent to improve their environmental and productivity performance, while workers, investors and customers increasingly seek companies who take environmental performance and sustainability seriously. New BEIS investment through the Research and Innovation Talent Fund will boost the supply of advanced skills in the short term, and government can now consider how to sustain long-term support for top talent.

[33] NERC supports excellent research and innovation across the UK: 70% of NERC funding is invested outside London and the South East.
[34] The impact of doctoral careers (2014)
[35] The impact of doctoral careers (2014)
[36] NERC Impact Report 2016
[37] Centre for Doctoral Training in Quantitative and Modelling Skills in Ecology and Evolutions; Centre for Doctoral Training in Next Generation Unmanned Systems Science; Centre for Doctoral Training in Data, Risk & Environmental Analytical Methods; Centre for Doctoral Training in Oil and Gas; http://wp.lancs.ac.uk/stars/
[38] Smart observation training meets industry need across multiple sectors and Training in Oil and Gas creates a highly skilled workforce with expertise that can be used across the wider energy and environment sectors

PILLAR 3: Upgrading infrastructure

Q15: Are there further actions we could take to support private investment in infrastructure?

Q16: How can local infrastructure needs be incorporated within national UK infrastructure policy most effectively?

33. Infrastructure investments are long-term and, once built, resource inefficiency and susceptibility to environmental shocks are locked in. Investors get better returns from low-carbon infrastructure that is resilient to future climate hazards such as extreme heat, wind, floods and drought. Environmental scientists already provide intelligence on future climate risks and design standards, helping to identify where to locate essential transport and energy infrastructure[39] and how to reduce losses from storms[40]. To make better economic decisions, infrastructure owners, builders and operators are now looking for reliable information on environmental futures to inform financing and business models (for example to move to long-term service provision) and to reduce operating costs (for example through resource efficiency and resilience to environmental shocks).

34. Developing policy that is appropriate at national, regional and local scales requires understanding of the interdependencies and risks across the multiple infrastructure systems (for example, transport, power, communications, water) and the changing environment within which they operate[41]. Investment should focus on research, monitoring and innovation to understand environmental risks to infrastructure, and to provide whole-system models and tools that incorporate historic and real-time environmental information, together with future environmental projections.

35. The global spend on capital projects and infrastructure is expected to double, exceeding $9trillion by 2025[42]. We are well placed to capitalise on the opportunities for UK business to export environmental goods and services for resilient infrastructure, clean air and water. Interventions should therefore encourage investors to build on existing opportunities, for instance through UK environmental science partnerships in water and air pollution with China and India.

PILLAR 7: Delivering affordable energy and clean growth

Q27: What are the most important steps the Government should take to limit energy costs over the long-term?

Q29: How can the Government, business and researchers work together to develop the competitive opportunities from innovation in energy and our existing industrial strengths?

Q30. How can the Government support businesses in realising cost savings through greater resource and energy efficiency?

36. Policy interventions to limit energy costs should focus on innovations that reduce the cost of energy generation and supply and lower the overall level of energy and resource consumption.

[39] Using environmental science to identify, quantify and manage environmental risks to infrastructure
[40] People, homes and business protected from winter floods 2013–14 (NERC Impact Report 2014, Page 12)
[41] For Example, Dungeness nuclear power station, and the Channel Tunnel, used real-time environmental monitoring to prevent costly shutdowns, following the 2007 Folkestone earthquake: Earthquake monitoring and seismic hazards (BGS03)
[42] Capital project and infrastructure spending - outlook to 2025 (PwC, 2014)

37. Energy generation costs, to users and suppliers, can be reduced though technology innovation and improvements. There is considerable demand for environmental science to safely find, extract and extend the life of existing natural energy resources[43], and to identify the most cost-effective locations for harvesting new sources of renewable energy[44]. Environmental science also provides the evidence to inform policy and regulations to meet environmental commitments and to minimise the cost of decommissioning[45], which lowers the overall cost of the system.

38. Innovations in resource management are helping users lower their energy (and overall resource) consumption. For example, major manufacturing companies rely on environmental software tools such as CCALC (which is enabling 4,500 companies) to reduce their environmental impact, meet regulatory targets and reduce business costs[46]. International food suppliers are using the Cool Farm Tool[47] to reduce greenhouse-gas emissions from their supply chains and enable farmers and suppliers to reduce their energy costs. As populations increase and new technologies come to market, the demand for innovation in resource management will increase. This will require secure, long-term investment in Earth observations and surveys that monitor and measure environmental resource availability and the impacts of using natural resources.

39. There are many opportunities for UK competitive advantage in affordable energy and clean growth, and the energy industry is hungry for UK's world-leading environmental science and technology[48]. For example:

    (i) To use robotics – autonomous sub-sea vehicles developed originally for marine research – to monitor energy infrastructure and its environmental impacts safely and cost-effectively in hazardous environments.

    (ii) To use new underground monitoring facilities for innovation to reduce the risks and costs of underground operations, together with world-leading capability in visualising underground geology, for geothermal, nuclear and shale gas energy, carbon capture and waste storage.

    (iii) To use environmental intelligence – derived from the UK's enormous wealth of environmental, health and social information – to generate smart decision tools for business to improve resource efficiency and productivity. Such environmental intelligence is often location-specific, so can support growth and jobs in rural, coastal and city locations across the UK. And we can export our expertise in environmental services to take a lead in rapidly growing global markets.

    (iv) To develop new Earth observation technology that simultaneously boosts the UK satellite manufacturing sector and provides businesses with vital environmental information. For example, Airbus Space and Defence (UK) recently won a contract with the European Space Agency to provide a satellite to monitor carbon stocks in forests.

    (v) To further improve the UK's world-class weather and flood forecasting, which is used by businesses across many sectors – such as agriculture, construction, insurance, renewable energy, transport and water – to optimise resource use and to reduce operating costs.

    (vi) To meet industry's needs for advanced skills and top talent, as set out in Pillar 2 above.

[43] Realising the potential of the UK's underground energy resources
[44] Providing insight into the location of the UK's largest offshore wind farm, Developing floating wind farms
[45] Decommissioning the North Sea
[46] Carbon Calculations over the Life Cycle of Industrial Activities (CCaLC)
[47] The Cool Farm Tool (NERC Impact report 2015, P13)
[48] International comparative performance of the UK research base 2013

PILLAR 9: Driving growth across the whole economy

Q34: Do you agree the principles set out above are the right ones?

40. In the Green Paper government proposes to create competitive funding streams to support world-class clusters of research and innovation in all parts of the UK, whether they are led by businesses or universities, and to consider expanding HEIF and KTPs. Such intervention would provide a welcome boost to existing Research Council and Innovate UK funding and brokerage that is well dispersed across the UK but spread thinly. For example more than 70% of NERC funding is invested outside London and the South East. And NERC has recently launched new investment for research organisations to work with business, policy and other actors for economic development specific to their location (regional impacts from science and the environment, RISE). Our first RISE awards will support the South West Partnership for Environment and Economic Prosperity (SWEEP, led by Exeter University) and the Yorkshire Integrated Catchment Solutions Programme (iCLASP, led by Leeds University). Government intervention should therefore aim to boost the volume of funding available to support such research-innovation partnerships across the UK, and to provide complementary support for businesses across the UK to access excellent research wherever it is found.

PILLAR 10: Creating the right institutions to bring together sectors and places

Q36: Recognising the need for local initiative and leadership, how should we best work with local areas to create and strengthen key local institutions?

Q37: What are the most important institutions which we need to upgrade or support to back growth in particular areas?

41. Sustained support for local and regional clusters and innovation hubs is important for building the long-term collaboration between businesses and researchers that drives innovation and growth. Regional clusters are able to link LEPs, businesses, research organisations and other actors. Universities and Research Council Institutes play key roles in such clusters, and institutes generate significant economic impact across the UK.[49] Institutes produce new cutting-edge research knowledge, leverage public-private investment, bring collaboration with national and international networks, and provide access to world-class national capability, facilities and test-beds that SMEs and even large companies cannot afford by themselves. For example environmental research institutes play a key role in local growth and jobs through the South Coast Marine Cluster (involving the NERC National Oceanography Centre and its Marine Robotics Innovation Centre) and the Midlands Engine (involving NERC's British Geological Survey and National Centre for Earth Observation).

42. It is important to recognise that innovation often crosses traditional sectors – for example, robotics and autonomous systems has applications in marine, agriculture, healthcare, automotive and aerospace sectors. BEIS is supporting self-assembling local or regional clusters to identify innovation strengths and growth opportunities through Science and Innovation Audits – now further support can help to seize these opportunities.

43. Because Research Council Institutes and other public sector research establishments (PSREs) play a vital role in business innovation partnerships, we need to ensure their health and sustainability. Flat-cash funding for Research Councils since 2010 means the spending power of core funding for research institutes has eroded, while QR funding for universities has been relatively protected.

[49] Knowledge Exchange and Research Council Institutes, NCUB 2016

Significant new funding for cross-cutting initiatives such as the Global Challenges Research Fund and the Industrial Strategy Challenge Fund may not necessarily support the essential national capability that institutes provide. The creation of UK Research and Innovation (UKRI) provides the opportunity to address the health and sustainability of research institutes across all disciplines on a national scale.