

Defra's Evidence Investment Strategy 2010–2013 and beyond



defra
Department for Environment
Food and Rural Affairs

Our purpose

'to secure a healthy environment in which we and future generations can prosper'



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Foreword from the Secretary of State

Defra is responsible for some of the most pressing and urgent policy issues for the UK and internationally. Our purpose **‘to secure a healthy environment in which we and future generations can prosper’** will be key to securing a sustainable economic recovery.



Our priorities are interlinked:

- securing a healthy natural environment for us all and dealing with environmental risks;
- promoting a sustainable, low-carbon and resource-efficient economy; and
- ensuring a thriving farming sector and a sustainable, healthy and secure food supply.

We need to be equipped to provide evidence to support this work now and respond to the big challenges of the future. In order to do this, in times of tight budgets, we need to work much more effectively with our key external partners.

A great deal has happened since we published **‘Our Approach to Evidence’** in 2006. We now understand more about the pressing challenges facing the earth’s climate, ecosystem services and the supply of sustainable and healthy food. There has never been a time when there was a greater need for good quality evidence to contribute to policy making and sound decisions, yet this need comes in the midst of a global economic downturn, the speed and ferocity of which has taken us all by surprise.

I am therefore delighted to present this new strategy for Defra’s investment in evidence. This highlights the priorities that Defra will focus on to help us respond to today’s pressing needs and prepare for tomorrow’s challenges. It also provides a number of practical recommendations on how we can embed culture change in the way the Department works to deliver benefits, impact and value for money from our significant spend on gathering and using evidence.

A handwritten signature in black ink, appearing to be 'H. Be'.

Foreword from the Chief Scientific Adviser

I am delighted to introduce Defra's Evidence Investment Strategy for 2010–2013 and beyond. Our environment is changing at an unprecedented rate; the major global challenges of climate change, protecting ecosystem services and ensuring a sustainable food supply call for quality evidence and innovation to contribute to good policy making and sound government. Defra recognises this and invests heavily in evidence: approximately £240m to evidence-related activities, including research, surveillance and scientific specialists in 2009/10.



My primary role as Defra's independent Chief Scientific Adviser (CSA) is to challenge the quality, direction and balance of Defra's evidence gathering and its use. In this I am supported by the heads of profession for economics, statistics and social research and other colleagues. Over the last year, I have had the opportunity to work with Defra's policy programmes to exhaustively explore the activities of the Department. I'm immensely grateful for the efforts put in by Defra colleagues and impressed with their willingness to embrace challenge.

I conclude that Defra's evidence gathering is clear, well managed and well focused to deliver Defra's challenging policy goals. This is an excellent achievement and Defra should feel proud. However, in order to meet our demanding policy objectives within the context of the increasingly difficult financial climate, we need a step change in our approach to evidence and innovation. I have made a number of recommendations within this strategy to facilitate this and to build on our achievements to improve the work both within the Department and its interfaces with the wider scientific community.

This strategy outlines these changes in Defra's approach to evidence. It provides a clear vision to guide the future of evidence gathering and use by Defra policy teams. It provides practical guidance for the management, quality assurance and use of evidence and the expertise we need, which I am sure will be welcomed by the Department and others. I am confident that this strategy will help guide us through the challenging times ahead, to the benefit of public value and of effective evidence-based policy making.

A handwritten signature in black ink, which appears to read "R. J. Watkinson". Below the signature is a horizontal line that tapers at both ends, serving as a decorative underline.



Executive Summary

We published our Evidence and Innovation Strategy¹ in 2006. Since then there have been significant changes in the political, financial and scientific context since. Human activities are changing the Earth's climate and degrading ecosystems at an unprecedented rate, while the growing global population and lifestyle changes are requiring more food, which will need to be produced within increasing environmental constraints. These issues interact with each other and cut across policy and scientific boundaries. The more we know, the more we understand that our big challenges on climate change, sustainable food supply and protecting ecosystem services are interdependent and need urgent attention.

Defra's business covers large sectors of our economy and impacts in multiple ways on our society. The UK agriculture and food sector accounts for 6.8% of the total economy and the 'green' industries sector has been calculated to be worth over £100 billion to the UK economy, and is forecast to increase in value by up to £45 billion by 2015. Climate change and ecosystem service degradation will have huge consequences: the 2006 Stern Report to the Government on the economics of climate change calculates the cost of inaction to be between 5–20% of global Gross Domestic Product (GDP) by 2050. The Economics of Ecosystems and Biodiversity (TEEB) study has assessed the global impact of lost environmental services at \$2–5 trillion/yr. Protecting these social goods and promoting sustainable economies is highly dependent on evidence-based policy making, and requires innovation on a transformational scale.

We need to tackle these high priority challenges at a time of unprecedented pressure on public finances. As well as responding to these big evidence challenges there are a number of evidence activities that Defra has to undertake to support day to day business and to meet legislative requirements for monitoring and surveillance. Such 'licence to operate' activities are essential to support Defra's core business. The global credit crunch and the resulting public sector budget deficit means tough choices have to be made about priorities for public sector spending. Whatever the outcomes of these deliberations, Defra will still need comprehensive and robust evidence to deliver good policy. But we will need to be smarter about how we get and use evidence, by exploiting synergies, working in partnership and slimming down our processes.

¹ Our approach to evidence and innovation 2005–2008.
See <http://www.defra.gov.uk/evidence/science/how/documents/EvidenceAndInnovation.pdf>

This document charts the way through these difficult times. It outlines Defra's plans and approaches to evidence gathering and innovation in the context of increasingly complex and interlinked issues, in a world where public expenditure will be under pressure and value for money increasingly scrutinised. It focuses on the commissioning and use of all the major sources of evidence by Defra programmes. It also discusses our links with our laboratory agencies, delivery network and Advisory bodies, together with key external partnerships (other Government departments, Devolved Administrations (DAs)² and Research Councils) and the capabilities (facilities, expertise) upon which we depend.

There is much to be proud of – the 2009 Cabinet Office Capability Review of Defra noted that we remain well regarded by stakeholders for our use of analysis and our scientific evidence base. In addition, the review of our science on behalf of the Government's CSA commended our approach to maintaining and building on strengths in the quality of our science and the use of scientific expertise in our Department and science agencies.

We need to build on this by further improving our performance in gathering and using evidence effectively for policy making and in evaluating the outcomes. Recent experience, especially in the development of the Living with Environmental Change programme (LWEC)³ and in our work on national and international environment assessments, has clearly demonstrated the value of co-operating with other evidence funders – in the Defra network, nationally, and internationally – to leverage our own investments. Our plan for the coming period will be to strengthen our interaction with others, to realise the considerable benefits from an increased level of 'joining-up' of the evidence base, especially across the challenges of climate change, sustainable food supply and protecting ecosystem services. The plans and approaches outlined below will be complemented by Good Practice guidance (see Annex 1) and an implementation plan to embed these changes.

2 The geographical coverage of Defra policy varies according to the terms of each of the devolution agreements with the administrations in Scotland, Wales and Northern Ireland. All our evidence supports policy in England and Wales, with much also underpinning policy throughout the UK.

3 Living with Environmental Change (LWEC) is a £1 billion five year programme funded by Research Councils, Government departments (including Defra), Devolved Administrations and delivery agencies. Its remit covers issues right across the Defra policy portfolio and big evidence challenges.

We will:

Prioritise investments between programmes. Through a process of close scrutiny and challenge we have established that:

- Overall, the Senior Responsible Owners (SROs) of Defra's policy programmes use their evidence budgets intelligently and the investment of recent years has been well justified in terms of policy needs and delivery;
- There are areas of Defra's portfolio where we see future needs for evidence growing or shrinking, e.g. a modest reorientation of priorities from such areas as animal welfare and pesticides towards areas such as water, biodiversity, soils and climate change would improve both the overall impact of our investments on the delivery of Defra's strategic objectives and our ability to respond to the big evidence challenges. Over time, we will want to deploy resources in ways that reflect these assessments;
- As budgets come under increasing scrutiny, we will use this analysis of priorities to guide our decisions.



Sharpen our focus to deliver evidence and innovation where we need it most in both the short- and long-term through:

- Ensuring that all our major programmes have plans for gathering and using evidence which demonstrate the line of sight between evidence activities and short- and long-term policy goals;
- Challenging evidence and evidence plans as an integral part of the business planning and approvals processes;
- Embedding the good practice we have identified across the business using more in-house consultancy;
- A range of activities to promote and create spaces for innovation.



Increase co-operation and communication both within Defra across the big evidence challenges and with our external partners to share our evidence investment, knowledge and expertise through:

- Overarching coordination across Defra to bring together all related evidence work on cross-cutting issues;
- Using our Evidence Forum to ensure creative discussions between teams;
- Identifying the linkages and dependencies between all the relevant evidence sources in the programme evidence plans, and using these plans to communicate our evidence needs and activities;
- Strengthening existing partnerships and developing new ones through LWEC and other collaborative programmes at national, EU and international level;
- Strengthening the Environment Research Funders Forum (ERFF) with more effective processes for members to share information on their programmes and outputs, and debate and agree future priorities;
- Promoting joint programming with our delivery partners, e.g. with the Environment Agency (EA) on water and waste;



- Improving knowledge exchange by jointly reviewing, developing and evaluating programmes and projects with the customers they serve;
- Promoting data sharing and knowledge exchange on the 'collect once, use often' principle;
- Recognising and rewarding good communication skills in specialists via a CSA's award for excellent communication of evidence.

Develop and organise the right skills, expertise and capabilities to give us access to comprehensive, robust evidence and advice by:

- Improving workforce planning for specialists within Defra to ensure we have the right mix of skills, including through inward and outward secondments and fellowships;
- Improving career development and planning for our specialists to ensure they and Defra have the right mix of skills;
- Enhancing social research capability in the Department;
- Maintaining and building key external capabilities and developing appropriate monitoring and/or partnership arrangements.

Refine our processes to ensure we are lean and fit for purpose, by:

- Ensuring that business processes take a comprehensive approach to evidence, including through an increased challenge role for the CSA in business decisions;
- Improving the efficiency and effectiveness of our procurement and use of evidence.



1. Why Defra needs a strategic approach to evidence

1.1 Introduction

1. Defra's purpose is to secure a healthy environment in which we and future generations can prosper. In order to achieve this Defra has identified three overarching policy priorities:
 - Securing a healthy natural environment for us all and dealing with environmental risks;
 - Promoting a sustainable, low-carbon and resource-efficient economy;
 - Ensuring a thriving farming sector and a sustainable, healthy and secure food supply.
2. In delivering these goals, we face growing challenges in providing the evidence to evaluate and respond to the problems of mitigating and adapting to climate change, maintaining a safe and sustainable food chain and maintaining the clean air and water, healthy soils, landscapes and biodiversity that we cherish but all too often take for granted. These challenges cut across policy and disciplinary boundaries.
3. These evidence needs are not confined to scientific exploration of the issues and technological options to address them. Many of the challenges arise as a result of changes in our daily lives that have occurred over the past twenty years, incorporating new ways of living and new technologies. We have become more aware of the environment and how our actions are putting pressure on it. Recognising these challenges, many of us have started to live in a 'greener' way, e.g. using low energy light bulbs, recycling more and throwing away less food. These are all positive steps, but this is only the beginning of the path to even greater change for individuals, businesses, communities, and as a nation. This will need to be supported by good quality evidence, including social science about what we need to do, how we go about doing it and how we measure the effect of the policies and changes.
4. Further, we need to tackle these challenges at a time of unprecedented pressure on public finances. The global credit crunch and the resulting public sector budget deficit means tough choices have to be made about priorities. Defra will still need comprehensive, robust evidence to deliver effective policy, but our performance in gathering and using evidence will need to be smarter by prioritising, making the most of synergies, working in partnership and streamlining our processes.

1. Why Defra needs a strategic approach to evidence

5. Since Defra policies influence a significant proportion of the UK economy, there are good economic reasons for ensuring they are based on the best evidence. For example, the agricultural sector in the United Kingdom accounted for a total estimated gross-value-added of around £80 billion in 2007. It uses around three quarters of the country's land area and employs around half a million people.⁴ The UK's natural heritage attracts millions of visitors every year, contributing £85 billion a year to the economy through tourism.⁵ The global market for low carbon and environmental goods and services was worth £3 trillion in 2007/08.⁶ In the UK this market is worth over £100 billion and employs 880,000 people either directly or through the supply chain.⁷ Defra's policies on sustainable consumption and production, and adapting to climate change, help to drive this market. Our policies on all of these sectors need to be informed by comprehensive evidence and through analysis of the benefits of environmental goods and services.
6. Defra's planning for investment in evidence gathering and innovation is largely carried out within its policy programmes, which are aimed at delivering our Public Service Agreement (PSA)⁸ and Departmental Strategic Objectives (DSOs). But we also need to consider the totality of this investment at a corporate level because:
 - The big evidence challenges we face (see section 1.3) are large and interlinked;
 - Defra's individual policy aims are inter-related, – e.g. our policies towards water supply and conservation link to our policies on sustainable farming – so the evidence needs are similarly linked;
 - Defra's policy development is linked to delivery by its network of agencies – we share common evidence needs;
 - Defra's evidence needs and programmes interlink with those of other Government departments, agencies, DAs,⁹ the Research Councils, other countries and international organisations;

⁴ Agriculture in the United Kingdom 2008, see https://statistics.defra.gov.uk/esg/publications/auk/2008/AUK2008CHAPTER7_AUK.pdf

⁵ Visit Britain press release, see http://www.britishtourismweek.com/assets/BTW_Dates_and_patron_announced.pdf

⁶ Innovas (2009) Low Carbon and Environmental Goods and Services (LCEGS): an industry analysis, see www.berr.gov.uk/files/file50253.pdf

⁷ The UK Low Carbon Industrial Strategy 2009, see <http://www.berr.gov.uk/whatwedo/sectors/lowcarbon/lowcarbonstrategy/page50105.html>

⁸ The Comprehensive Spending Review 2007 set out a series of Public Service Agreements (PSAs) defining key priorities for the government for the period from April 2008 until March 2011. Within our PSA, Defra has 9 Departmental Strategic Objectives. See <http://www.defra.gov.uk/corporate/about/how/busplan/spending-review/psa2007.htm>

⁹ The geographical coverage of Defra policy varies according to the terms of each of the devolution agreements with the administrations in Scotland, Wales and Northern Ireland. All our evidence supports policy in England and Wales, with much also underpinning policy throughout the UK.

- Defra’s policy programmes are sharply focused on delivery of current Government policy, but we also need to keep an eye on new issues affecting our responsibilities through horizon scanning;
 - Defra is a big enough investor in its own sector for its decisions in aggregate to have significant effects on the viability of specialist teams, institutes and other evidence suppliers – we need to plan for our future needs;
 - On the other hand, Defra is a relatively small investor compared to the Research Councils, the European Union (EU), and the sum total of expenditure in other countries and organisations – we need to be an influential player in this bigger picture;
 - Defra’s policy goals are very challenging – the scale of innovation we will need is significant and we need to focus our resources to best effect to deliver it;
 - Defra is above all an influencing Department – we have few direct levers but a big role in influencing others to deliver our environmental goals through their policies (transport, infrastructure, education, etc). Effective influence comes from being ‘first with the best evidence’ – understanding the issues, providing evidence for our views and ideas for innovative solutions. So ensuring that our evidence is ‘cutting edge’ is a corporate priority.
7. For these reasons, we regularly review our investment corporately, on a cycle that aligns with the Spending Rounds; this Strategy is intended to cover the years from 2010 to 2013 and is set in the context of, and helps us prepare for, the challenges that will dominate succeeding decades.
 8. This Strategy is intended to set direction and provide guiding principles to Defra policy and evidence specialist colleagues on our commissioning and use of evidence. It will help inform the wider Defra family and our research partners in Defra’s evidence landscape (illustrated in Figure 2). The Strategy addresses both the content of our programmes and our approach to managing them to obtain the best value for money; we aim to continually improve our performance in both the gathering and the use of evidence. Annex 1 sets out Good Practice guidance, describing how the evidence gathering process operates and provides input to policy. It introduces the concept of an Evidence Cycle to sit alongside the established Defra Policy Cycle.

1.2 What we mean by evidence and innovation

What is evidence?

9. For the purpose of this Strategy we have defined evidence as 'reliable and accurate information that Defra can use to support sound decisions in developing, implementing, and evaluating policy'.
10. It is delivered by both external and internal sources, and includes the analysis of externally sourced information by in-house or external experts. It involves, but is not limited to:
 - Economic, social and natural scientific information, including operational research;
 - Analysis, advice, monitoring, surveillance, statistics and research.
11. It includes facts, risks, uncertainties, ambiguities and analysis of the limits to knowledge concerning current and future situations, and the viability of alternative options for future innovative solutions. One of the key goals of the Strategy is to ensure that the evidence we invest in helps to foster innovation.



What is innovation?

12. Innovation is concerned with the ways in which we create new systems of knowledge and ideas, opportunities for production and consumption, and options for policies. Innovation has in the past been considered to be a process of investing in research, leading to new technologies and products, but is now often considered to be much broader, including service delivery and working practices. A useful definition is 'the successful exploitation of new ideas' – in essence, it is about doing things better.
13. However, there are different scales of 'doing things better':
 - Incremental innovation refers to small innovations, or improvements to optimise existing systems of knowledge, e.g. reducing packaging waste;
 - Radical innovation refers to partial system redesigns, e.g. improvements in recycling which require innovations in product design and infrastructure for recycling;
 - Transformative innovation refers to full system redesign and culture change in the way people think about products and services, e.g. industrial ecologies or life cycle approaches to product design.
14. This document is not a comprehensive 'innovation strategy' for Defra.¹⁰ Here we chart the role of evidence and evidence investments in stimulating innovative approaches. We are concerned with applying innovative thinking in a number of different ways:
 - Innovating the ways we obtain and use evidence – faster or more efficient ways of connecting and sharing data and information amongst all users including policy-makers (e.g. in Defra the Strategic Evidence Fund encourages teams to develop innovative evidence proposals);
 - Using evidence investments to explore innovation in policy making – looking for cheaper, more effective, more acceptable ways of achieving our outcomes (e.g. use of social research to provide better understanding of our target groups, leading to more effective communication of key messages);
 - Using evidence investment to explore how innovation in the economy can help deliver our objectives and outcomes, and using knowledge exchange to encourage the private sector to innovate where it will have a positive impact in delivering our policy goals (e.g. Technology Strategy Board (TSB) projects directly involve the industry).

¹⁰ Defra will consider further how to foster innovation in policy making more generally

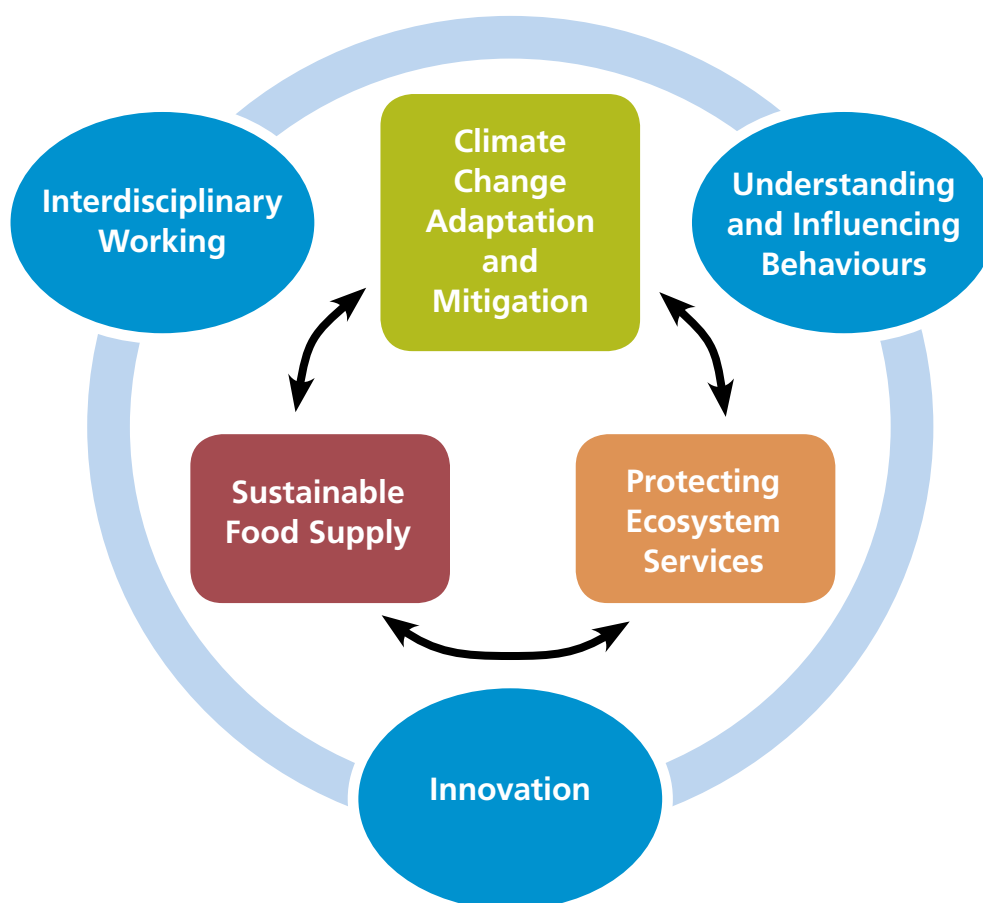
1.3 The big evidence challenges

15. In September 2008 our CSA hosted a workshop for a range of key stakeholders, including members of Defra's Science Advisory Council (SAC), other social and natural scientists, economists and Defra policy-makers. The aim of the workshop was to review the future challenges to the Department and the corresponding needs for evidence and innovation. Out of this meeting emerged a vision of the three major inter-linked evidence challenges facing Defra and some of the main approaches that the Department would need to adopt if it were to be able to deal with them. The three big evidence challenges are around:

- Climate change;
- A sustainable food supply;
- Protecting ecosystem services.

The approaches identified were interdisciplinary working, understanding and influencing behaviours, and innovation.

Figure 1: The big challenges



16. Understanding the linkages between biodiversity and ecosystems, our food supplies and our climate is not only crucial to our physical understanding of the world around us, but to understanding our long-term economic well-being as well. The Stern report (2006) on the economics of climate change¹¹ showed that if we do not act on climate change, the overall costs and risks by 2050, which include damage to ecosystem services, including food supply, will be equivalent to losing at least 5% of global GDP each year. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of global GDP or more. The Economics of Ecosystems and Biodiversity (TEEB) study has assessed the impact of lost environmental services at \$2–5 trillion/yr.¹²
17. Much of Defra’s current portfolio of work is covered by these three inter-linked big evidence challenges. Some issues within our remit (e.g. noise or rural communities) are less strongly linked to the big evidence challenges but are driven by political imperatives, either from within the UK or from the EU. These issues are also important – often the UK is legally bound to deliver on them – and this Strategy covers the evidence needs around all of our remit.

Climate change

18. Climate change is one of the greatest challenges facing society today. If the world continues emitting greenhouse gases (GHGs) at today’s levels then average global temperatures could rise by up to 5–6°C by the end of this century.¹³ This will make extreme weather events like floods and drought more frequent and increase global instability, conflict, public health challenges and migration of people to levels beyond our recent experience. Heat waves, droughts and floods would affect the UK too.¹⁴ Even if progress is made on the mitigation agenda, we will have to adapt to a warmer climate in the UK, with both more extreme events and also more gradual changes, such as in the pattern of the seasons. We need to be able to make sustainable adaptation decisions at the right time to maximise the benefits and minimise the costs. To make these decisions and to be able to influence others we need good quality evidence.
19. Climate change adaptation cuts across virtually all of Defra’s policy responsibilities, including farming and food, animal and plant diseases, ecosystems, water management, floods and conservation. It presents novel challenges in relation to individual and societal motivation and behaviours, policy processes and planning, and demands the utmost creativity to generate innovative responses that meet the scale and complexity of the issues.

¹¹ See <http://www.occ.gov.uk/activities/stern.htm>

¹² See <http://www.teebweb.org/>

¹³ IPCC 4th Assessment Report (2007).

See http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

¹⁴ UK Climate Projections (2009). See <http://ukclimateprojections.defra.gov.uk/>

1. Why Defra needs a strategic approach to evidence

20. The UK has set itself ambitious goals for mitigating climate change through cutting greenhouse gas emissions, and Defra has a key role to play in meeting these goals. Defra has a direct influence over roughly 15% of UK GHG emissions, as embodied in the Department's carbon budget.¹⁵ Defra needs to understand and manage the carbon impact of all its work. This includes sectors such as agriculture, waste and fluorinated gases, all of which have already contributed significantly to the UK's progress in reducing emissions but which now face some of the greatest evidence challenges in the future. The cross-cutting work of the Sustainable Consumption and Production and the Food Chain programmes aims to drive an economy-wide low-carbon transition. The challenges posed by climate change were only revealed through high quality evidence – including key contributions from the UK and Defra – and all successful climate change adaptation and mitigation work relies on evidence.

Sustainable food supply

21. The Government's vision for the food system is one that is more sustainable – economically, socially and environmentally.¹⁶ The future strategic policy objectives for food should be to secure: fair prices, choice, access to food and food security through open and competitive markets; continuous improvement in the safety of food; a further transition to healthier diets; and a more environmentally sustainable food chain. Food is a complex and cross cutting issue so there is a coordinated effort across Government on food issues¹⁷ involving the Food Strategy Task Force and the development of a cross-government Strategy for Food. Departments will need to continue to work together to share evidence and produce consistent and robust food-related messages, for example on diet and health, sustainability and consumer choice. To contribute to this vision, Defra has a DSO to ensure sustainable, secure and healthy food supplies.¹⁸
22. In recent decades, we in the UK have benefited from a greater choice of food. Despite recent price rises, food has, in general, become more affordable over the last thirty years. Over the same time global food production has grown consistently faster than population, but with serious environmental costs. However, we cannot assume that these trends in production will continue, nor is there any excuse for complacency about the effects of unsustainable practice in our global food supply chains. There are large and growing challenges for the world's food supply, and we need to ensure we are equipped to meet them.

¹⁵ The UK Low Carbon Transition Plan.

See http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

¹⁶ See http://www.cabinetoffice.gov.uk/strategy/work_areas/food_policy.aspx

¹⁷ Food Matters Towards a Strategy for the 21st Century.

See http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf

¹⁸ See <http://www.defra.gov.uk/foodfarm/food/security/index.htm>

23. To feed a growing, wealthier global population, food production will have to increase dramatically, e.g. the World Bank estimates that between 2000 and 2030 cereal production needs to increase by 50% and meat production by 85% to meet demand.¹⁹ To achieve this, there needs to be both a significant reduction in waste (both in the developed and developing worlds) and a significant increase in primary production. The world's ability to grow food depends on finite global resources, such as ecosystem services and energy, so we will need to grow more food with fewer resources.
24. The whole food chain, including all the post-farm-gate emissions like transport, processing, retailing, storage/refrigeration and cooking, contributes around 18% to UK GHG emissions.²⁰ Defra's policy area covers a large proportion of this contribution. If we are to avoid dangerous levels of climate change we will need to reduce these emissions, along with other sources of GHGs. Climate change will also alter what we can grow where, both in Europe and throughout the world. We need to be prepared for, and be able to adapt to, these changes.
25. Food production affects and is affected by ecosystem services and climate change (both mitigation and adaptation) so a holistic approach is needed.
26. The UK enjoys a relatively high level of food security today, but we cannot be complacent. We need a better understanding of the impacts of increasing demand, the effects of climate change, new pressures on land (e.g. for biofuels) and high energy prices. We also need better information on the pressures on fish supply due to warmer sea temperatures, ocean acidification and increasing demand.
27. Reducing the food chain's dependence on energy, water and other resources will reduce its exposure to future increases in resource prices. Reducing the quantity of waste and GHG emissions can improve resource efficiency and anticipate the changes required for the transition to a low-carbon economy.

Protecting ecosystem services

28. There have always been compelling arguments for protecting individual ecosystems on the basis of their aesthetic and cultural values. However, it is becoming increasingly clear that our natural environment offers more tangible benefits to the economy, lifestyles and even survival. These benefits are often referred to as ecosystem services and cut across Defra's policy areas:
 - Provisioning, such as food and water;
 - Regulating, such as regulation of floods, land degradation and disease;

¹⁹ See <http://www.millenniumassessment.org/>

²⁰ Food Matters Towards a Strategy for the 21st Century.
See http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf

1. Why Defra needs a strategic approach to evidence

- Supporting, such as soil formation and nutrient cycling;
 - Cultural such as recreational, spiritual and other non-material benefits.
29. The publication of the United Nations Millennium Ecosystems Assessment²¹ has stimulated widespread international debate about the importance of the links between ecosystems and human well-being. At global scales it found that 60% of the ecosystem services on which people depend are being damaged through human action or mismanagement. As a result there is now considerable interest in finding out more about what is happening at regional and national scales. In the UK the National Ecosystem Assessment, funded jointly by Defra, Natural Environment Research Council (NERC) and the Scottish Government (SG), is now underway.²²
30. If we are to achieve sustainable patterns of economic and social development we need to work out different approaches to policy development and implementation for environmental goods and services. The Millennium Ecosystem Assessment not only recognised the multiple benefits that ecological systems provide but also highlighted that policy and planning decisions must take into account an ecosystems approach to be truly sustainable. In response to this Defra is pioneering an ecosystem services approach to policy making that aims to take into account interactions between different natural systems. This includes considering how to better define and communicate desirable outcomes. Defra needs to do more work to embed the ecosystems approach throughout our policy portfolio, particularly for ecosystems such as water, marine and coastal environments.
31. Climate change in particular underlines the need for a long-term, ecosystem-based approach. Not only will habitats and species be affected directly by climate change and sea level rise but they will also be affected by policy and behavioural shifts in sectors such as agriculture, water, transport and energy. While the general principles and direction of climate change impacts on biodiversity in the UK are understood, the details and timing of impacts on individual species, habitats and sites are very uncertain. This is a long-term agenda, requiring a more sophisticated understanding of the value of ecosystem services and the relationship between economic and environmental performance.

²¹ See <http://www.millenniumassessment.org/>

²² See <http://uknea.unep-wcmc.org/Home/tabid/38/Default.aspx>

1.4 Approaches to evidence gathering and analysis

32. As well as a greater emphasis on integrating our evidence across the three big challenges, the issues that Defra needs to tackle require a shift in approaches to evidence. We need to move towards more interdisciplinary work, with a much greater emphasis on human behaviour and the motivations that change it, and on the stimulation of innovation in both our evidence and the policies, technologies and infrastructures that will enable us to deliver our outcomes.

Interdisciplinary working

33. Many of the problems Defra deals with cut across policy issues and academic disciplines; they relate to the interactions of human society, the economy and the natural world. Interdisciplinary working integrates concepts from different disciplines resulting in a synthesised or co-ordinated coherent whole. Interdisciplinary research is very valuable for advancing understanding and the knowledge base as well as solving complex problems.
34. Defra's policies are all based on five principles – we want to live within environmental limits and achieve a just society, and we will do so through having a sustainable economy, good governance, and sound science. The evidence needed to achieve outcomes in line with these principles is simply not amenable to single discipline study. It depends on natural scientists, social researchers, economists, statisticians, operational researchers, engineers, technologists and others working together to coordinate evidence gathering and interpretation across disciplines into a coherent whole. These in-house experts work in close partnership with policy analysts as an integral part of policy teams on their journey around the Defra Policy Cycle (see Annex 1).

Operational Research

Operational Research is often described as the application of scientific approaches to problem solving. It provides a flexible toolkit of techniques that can be applied to a variety of problems. It can be used in complex policy or delivery problems, drawing together knowledge and evidence from a variety of sources in either a structured, qualitative way, or in quantitative models which can be used to construct 'what if' scenarios.

1. Why Defra needs a strategic approach to evidence

35. This is not just an issue for Defra. Other evidence providers and funders are also seeking to encourage increased interdisciplinary approaches, e.g. it is a key goal of the LWEC programme and a feature of the Research Excellence Framework being developed by the higher education funding bodies across the UK. We will work with partner organisations to help ensure their contributions to our evidence base are as joined up as possible.

Understanding and influencing behaviours

36. Policy actions around the challenges of climate change, sustainable food supply, and protecting ecosystem services all rely on an interdisciplinary approach to gathering evidence. Social research is recognised as a critical part of this disciplinary mix as it is *people* upon whom these policy actions will both impact and rely – as individuals, households, organisations, communities and society.

What is Social Research?

What is social research? Social research is a field of scientific enquiry which identifies, measures, explains and predicts changes in: social and economic structures; attitudes; values and behaviours; and factors which motivate and constrain individuals, organisations, communities and other groups in society. It includes research conducted by social scientists from a wide range of disciplines, for example social psychology, sociology, social policy, human geography, political science, social anthropology and education. Social research is about understanding people and institutions:

- What do they think about issues, and why?
- Why do they do what they do?
- Why don't they do what we think they should?
- How do attitudes, behaviours and social practices vary from place to place and from small scale (individuals and families) to large (communities, regions, countries)?
- How can we understand our actions in this light?

37. Understanding the interactions between different parts of people's lives, their understanding of future challenges and barriers and their motivations towards change is key to successful policy development. It is imperative to bring people's everyday lifestyles into line with sustainable living. In the past, governments relied on traditional forms of regulation, for example taxes and product bans, in order to promote large-scale transformational changes. Social research can reveal other routes for persuading people towards the most positive actions for the whole population. For example, from social research we know there is widespread scepticism and misunderstanding of the issues underlying climate change. Social research provides some understanding of how to overcome such problems and encourages new actions.

Innovation

38. For Defra to be able to deliver its challenging goal of securing a healthy environment in which we and future generations can prosper, and to meet the big evidence challenges, we will need to innovate on a variety of levels. Our targets are extremely challenging and perhaps impossible to deliver within current paradigms and require radical or even transformative new approaches.
39. Defra can use evidence investment to foster innovation in a number of ways to:
 - Generate innovative policy solutions to meet our goal of being a leader in policy innovation in Whitehall;
 - Deliver sustainability by encouraging technical innovations in our sponsored sectors in co-operation with the private sector, TSB, Waste and Resource Action Programme (WRAP) and others;
 - Encourage wider system-level innovation in the outside world through our policies, for example on sustainable consumption and production;
 - Improve the cost-effectiveness of our data gathering, monitoring and surveillance through better design and technology;
 - Improve the efficiency or effectiveness of our internal processes.
40. While innovation can happen spontaneously, making it difficult to predict where it will happen, a growing body of evidence shows that there are ways for policy-makers to foster innovation deliberately. Defra has a reasonably good track record in technical improvements in our sponsored sectors, but little of it goes beyond incremental change. The key challenges of radical or transformative innovation²³ do not lie in monolithic subsidies or 'picking winners', but rather in:
 - Engaging a wider range of stakeholders than usual (novel ideas often come from cross-fertilisation between fields);
 - Helping to make connections between areas not normally linked (there are examples in recent applications of IT to guide tillage and weed control);
 - Protecting innovations in their infancy (when they are costly and prone to error);
 - Preventing new ideas being jeopardised by vested interests or current technical lock-in;
 - Levering investments (through facilitating venture capital etc);
 - Facilitating learning, especially across existing silos and communities;
 - Encouraging new demand through informing expectations.

²³ SPRU 2009, see <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16756>

1. Why Defra needs a strategic approach to evidence

41. Innovation requires risk-taking. To deliver the sort of transformational change that our PSAs and DSOs require will mean focusing a proportion of Defra's research portfolio deliberately on high stakes/high wins Research and Development (R&D), ideally in partnership with others.

1.5 The current evidence landscape

42. Recent reviews of Defra's evidence base show there is much of which we can be proud. The 2009 Cabinet Office Capability Review of Defra²⁴ noted that we remain well regarded by stakeholders for our use of analysis and our evidence base. And the review of our science on behalf of the Government's CSA²⁵ commended our approach to maintaining and building on strengths in the quality of our science and our use of scientific expertise in our Department and science agencies.
43. We need to continue to build on this by further improvements to address the financial, policy and evidence challenges outlined in previous sections. Recent experience has clearly demonstrated the value of co-operating with other evidence funders – in the Defra network, nationally, and internationally. This section describes that evidence landscape and Defra's role within it.
44. Defra is investing approximately £240m on evidence in 2009/10. A breakdown of this can be seen in Table 1. This investment is spread across a number of areas and brings a wide range of benefits – pages 20 -22 provide some examples of these.
45. Total R&D spend has remained fairly stable over the last few years. The spend on 'other evidence' has fallen over the same period largely due to cost sharing initiatives with industry on animal health surveillance. 'Other evidence' includes monitoring and surveillance programmes and consultancy.

Table 1: Defra's evidence budget breakdown for 2009/10 across Defra policy areas.²⁶ All figures have been rounded to the nearest £m.

	Total R&D	Total other evidence	Total evidence staff	Total capital	TOTAL
Animal Health & Welfare (AHW)	36	45	2	1	85
Food & Farming Group (FFG)	29	3	3	0	35
Environment & Rural Group (ERG)	48	36	5	8	96
Strategy & Evidence Group (SEG)	13	4	3	0	20
TOTAL	125	88	13	9	236

²⁴ Civil Service Capability Review. See http://www.civilservice.gov.uk/Assets/DEFRA-WEB_tcm6-6651.pdf

²⁵ Office of Science and Innovation review. See <http://www.berr.gov.uk/files/file35751.pdf>

²⁶ See Annex 2 for an explanation of how the data were gathered and analysed for this exercise

46. Defra has three executive laboratory agencies, the Food and Environment Research Agency (Fera), the Centre for Environment, Fisheries & Aquaculture Science (Cefas) and the Veterinary Laboratories Agency (VLA). These agencies form an integral part of Defra, with their work directly supporting the delivery of our PSA targets and mapping closely to DSOs. Our agencies provide a range of scientific services (including inspectorate functions) supported by international-standard research. The agencies employ over 1000 specialist staff and deliver a significant proportion of the evidence and operational science needed by Defra for policy development and delivery, both nationally and internationally.

Food and Environment Research Agency (Fera)

Fera's overarching goals are to support and help develop a sustainable food chain and a healthy natural environment, and to protect the global community from biological and chemical risks. Fera gathers evidence for many areas of Defra's policy responsibilities, especially in relation to seed, plant and bee health, human/wildlife conflict, and environmental condition and land use.

Of its 900 staff, 650 scientists and specialists work in collaboration with many hundreds of partner organisations to gather and analyse evidence in support of Defra's strategic outcomes.

Centre for Environment Fisheries & Aquaculture Science (Cefas)

Cefas plays a vital role in securing healthy marine and freshwater environments, ensuring the sustainable use of natural resources, and understanding associated challenges presented by climate change.

With its 500 staff, and extensive laboratory facilities, Cefas is the UK's largest applied marine science laboratory and bridges the interface between science, policy and delivery. It provides scientific advice, manages related data and information, conducts world-class scientific research, and facilitates collaborative action through wide-ranging international relationships.

Veterinary Laboratories Agency (VLA)

VLA delivers research, surveillance, modelling, risk analysis, consultancy, epidemiology and diagnostics, as well as an emergency response capability for animal and public health. It has developed extensive national and international collaborations and partnerships to ensure the best evidence-based advice.

With its main research facility in Surrey and 15 regional laboratories across the UK, VLA employs around 1300 staff including scientific experts, epidemiologists and veterinary officers. As a centre of scientific excellence, VLA is a national and international reference laboratory for a wide range of farm animal diseases such as avian influenza, Transmissible Spongiform Encephalopathies (TSEs) and classical swine fever.

1. Why Defra needs a strategic approach to evidence

47. Defra also receives invaluable input from over 20 scientific and over 30 non-scientific (largely stakeholder) Advisory bodies. These range from overarching expert bodies such as the Royal Commission on Environmental Pollution to issue-specific scientific groups like the Air Quality Expert Group. The Sustainable Development Research Network (SDRN) is a good example of a body that integrates social and natural sciences.

The Sustainable Development Research Network (SDRN)

The SDRN is a network of researchers with a broad and diverse interest range including social researchers, natural scientists, economists etc. It is an active network which can be used to provide policy advice and expert opinion on sustainable development issues. It enables Defra to keep in touch and test ideas with a wide variety of sustainable development researchers and opinion leaders. The network provides excellent value for money, allowing us access to high quality expert advice at short notice and minimal cost.

48. Although Defra's investment in evidence is significant, it is small in comparison with relevant research funded by Research Councils, other Government departments, and in national and international programmes outside the UK. Defra's research ranges from 'strategic' to 'specific applied', using the standard Frascati definitions,²⁷ and thus largely falls between the 'basic/strategic' research of the Research Councils and the near market and technology development activities of the private sector and near private sector bodies such as TSB. When considering evidence we also need to be thinking about the wider evidence landscape, because the issues we face are often of common concern across Europe or globally and are too large for one organisation or country to tackle alone. The Defra evidence landscape is represented in Figure 2.
49. Defra has numerous links with these bodies, e.g. through joint research and the EU Research Framework Programme. Defra is a leading member of ERFF,²⁸ which brings together the UK's major public sector sponsors of environmental science to identify and develop areas of joint activity. Much of this activity is being delivered through LWEC,²⁹ a £1 billion five year programme funded by Research Councils, Government departments, DAs and delivery agencies. Defra is a major contributor; however, LWEC will deliver a wide range of evidence for Defra policy areas well beyond what our own investment is capable of delivering.

²⁷ See <http://browse.oecdbookshop.org/oecd/pdfs/browseit/9202081E.pdf>

²⁸ See <http://www.erff.org.uk/index.aspx>

²⁹ See <http://www.lwec.org.uk/>

Examples of LWEC Collaborations Contributing to Defra's Big Evidence Challenges

UK Ocean Acidification Research Programme – Defra contribution will be 30% out of £12.4m, with co-funding from NERC and DECC. The aim is to provide a greater understanding of the implications of ocean acidification (as a result of the absorption of anthropogenic carbon dioxide) and its risks to ocean biogeochemistry, biodiversity and the whole Earth system.

National Ecosystem Assessment – Defra contribution will be 60% out of £1.1m, with co-funding from NERC and SG. Following on from the Millennium Ecosystem Assessment this will produce the first assessment of the current state of all of the ecosystems in the UK. It will provide the evidence foundation of the ecosystems approach to policy, identifying both threats and opportunities.

Insect Pollinators Initiative – Defra contribution will be 25% out of £10m, with co-funding from the Biotechnology and Biological Sciences Research Council (BBSRC), NERC, SG and the Wellcome Trust. This initiative will investigate the factors that lie behind the declines in pollinators (such as honeybees and bumblebees), seeking to identify solutions to reverse those declines. Possible causes include disease, chemicals (such as pesticides), habitat change and a range of management practices.



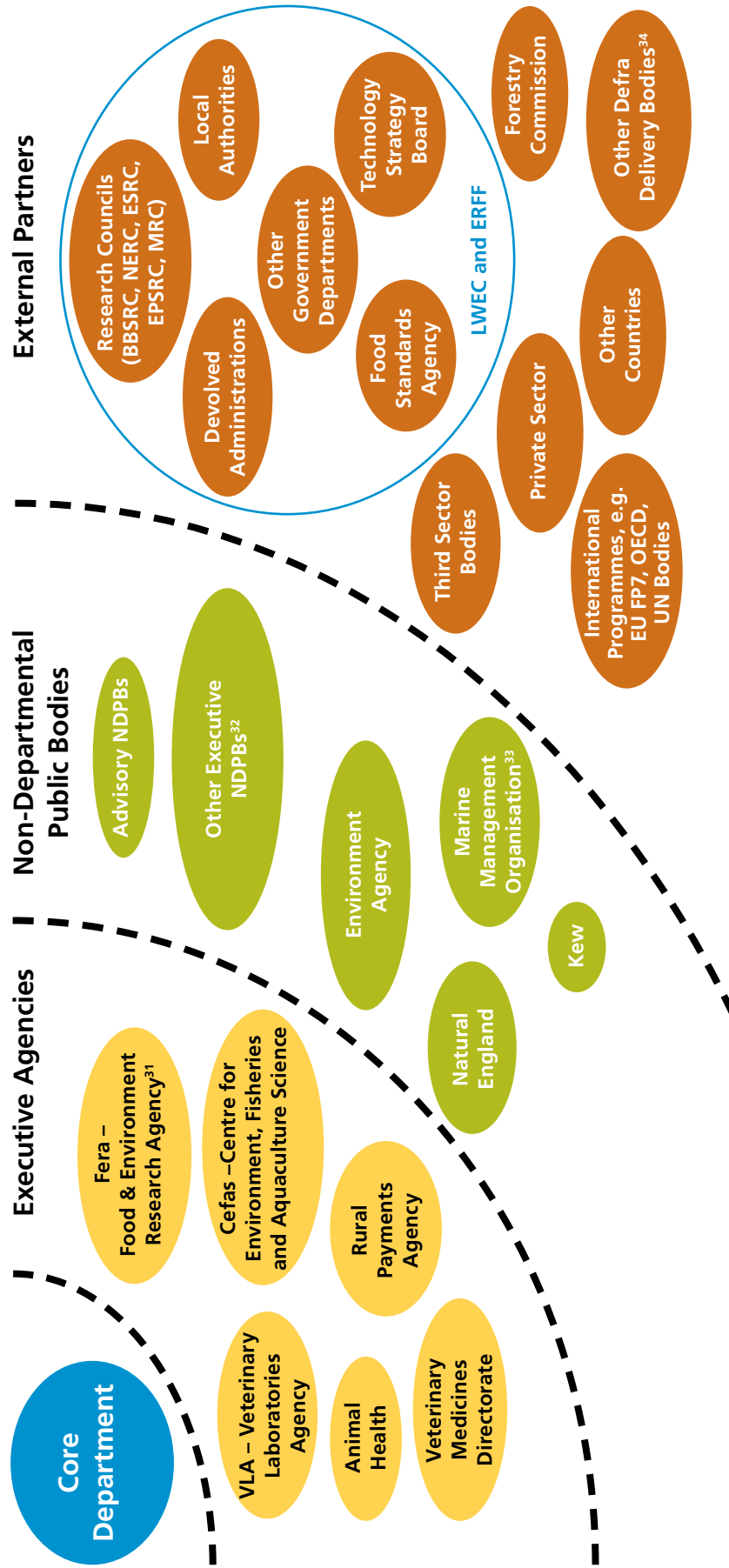
Centre in Understanding and Managing Natural and Environmental Risks – Defra contribution will be 25% out of £1.2m, with co-funding from NERC, the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC). Risk and the way we deal with it is a cross-cutting aspect of LWEC. This centre, based at Cranfield University, will enable improved management of risk through a focus on better understanding the ways the public responds to perceived risks in areas such as natural and man-made hazards, extreme events and new and emerging diseases.

1. Why Defra needs a strategic approach to evidence

50. UK and Defra scientists have also made significant contributions to large scale international assessments, for example the Intergovernmental Panel on Climate Change (IPCC) and the Millennium Ecosystem Assessment. These assessments have moved forward the knowledge base significantly, and have enabled UK scientists to contribute to influencing the global debate on international environmental issues. The approaches taken to international assessments, for example involving a large number of scientists from different backgrounds and disciplines, has helped to ensure that the approaches and policies adopted to tackle these issues are truly integrated and holistic.
51. Such assessments are excellent mechanisms for evaluating and synthesising the complete knowledge base for use in policy formulation and implementation, and for identifying key uncertainties that require further research. They evaluate both the risks of human activities on the environment (risk assessment), and approaches to manage those risks (risk management). They inform not only domestic policy decisions but play a vital role in informing international decisions, e.g. on reduction of ozone-depleting gases and mitigating and adapting to climate change. Being involved in such assessments has enabled British scientists to contribute to the global debate on international environmental issues. This helps keep UK science and scientists at the forefront of international thinking on key issues. These assessments have also led to national-level assessments to assist in domestic policy formulation and implementation, e.g. the National Ecosystem Assessment, the UK Climate Change Risk (impact and adaptation) Assessment and the Government Office for Science foresight studies.



Figure 2: Defra's Evidence Landscape³⁰



³⁰ Size of the bubbles is not related to the budget

³¹ Fera brings the Central Science Laboratory, Defra's Plant Health and Seeds Inspectorate, the Plant Variety Rights Office and Seeds Division and the Government Decontamination Service together into one agency

³² e.g. Joint Nature Conservation Committee, Sustainable Development Commission, Royal Commission on Environmental Pollution, Commission for Rural Communities

³³ MIMO is to be established under the Marine and Coastal Access Act and will replace the Marine and Fisheries Agency

³⁴ e.g. WRAP, NISP, Carbon Trust

1. Why Defra needs a strategic approach to evidence

Case Studies of Defra Evidence Informing Policy

Climate Change Modelling at the Hadley Centre

The Met Office Hadley Centre is one of the world's leading centres for climate change research. Its scientists make significant contributions to a variety of climate change reports, including the IPCC Assessment Reports. Its models and climate projections give Defra leverage in climate change negotiations and provide essential data to underpin the Government's Adapting to Climate Change programme. They have influenced policies and approaches, such as the 'Act on CO₂' campaign which aims to encourage people to take on new day to day actions to fight climate change.

GHG Inventories for Agriculture

Defra has developed the UK agriculture GHG inventories (methane and nitrous oxide). The research measured emissions resulting from different agriculture practices. This led to UK-specific factors which are applied to national statistics of fertiliser use and livestock numbers to estimate GHG emissions.

The inventory provides a means for estimating baseline emissions from 1990 to 2050, which are required to assess progress towards meeting the targets set out in the Climate Change Act. As part of the development of the inventory, potential mitigation measures have emerged, leading to further research to investigate their potential and develop them into usable solutions.

Farmland Birds

Populations of farmland birds are in serious decline. For example populations of skylarks have more than halved since the mid-1970s. Evidence from research and monitoring studies have shown the importance of providing a combination of winter food, breeding habitat and summer food resources – the so called 'Big 3'. Research has shown that leaving patches unsown in cereal fields ('skylark plots') was found to provide important foraging habitat for these birds and, as a result, skylark chick survival increased by up to 50%.

A range of these and other land management options designed to deliver the 'Big 3' across English farmland have been incorporated into Defra's Environmental Stewardship programme. The plots are also being promoted as part of a suite of measures in a major new industry-led initiative. If sufficient numbers of farmers adopt skylark plots and other evidence-based Big 3 options, there is a real possibility of reversing the decline in farmland bird numbers.

BeeBase

Fera's knowledge management team has won the 2009 Whitehall & Westminster World Civil Service Award for Knowledge Management and Analysis for their innovative work on BeeBase. This is a live on-line database used by beekeepers and The National Bee Unit (NBU) to manage valuable information on bee health across England and Wales.

BeeBase allows beekeepers to access their own apiary, diagnostic histories and details over the web. It provides information on the functional activities of the NBU, legislation, pests and diseases including their recognition and control, interactive maps, current research areas, publications, Advisory leaflets and key contacts. Inspectors use BeeBase to maximise their efficiency and effectiveness, using the information to home in on apiaries most at risk of pests or diseases.



Plant Pathogens

Phytophthora ramorum and *Phytophthora kernoviae* are exotic plant pathogens discovered in Britain within the last eight years. Defra led a cross-Governmental programme gathering evidence suggesting that these pathogens could kill significant numbers of trees and heathland species, destroying Sites of Special Scientific Interest, and impacting on local tourism and rural economies (e.g. the ornamental nursery stock trade). This evidence led directly to a new Defra-funded *Phytophthora* Disease Management Programme which began in 2009 led by Fera.

Integrated Control of Wheat Blossom Midge

The larvae of this midge attacks ripening grain and affects both yield and quality. This highly collaborative research project was designed to identify resistance in wheat varieties, develop methods for pest monitoring and Integrated Pest Management controls to reduce pesticide use. The combined effect is to meet Defra's aims of reducing pesticide use and maintaining biodiversity.

Breeders are convinced that the resistance identified is durable and will soon be in all Recommended List varieties. In years of severe outbreak this is estimated to have saved £60m to industry through prevention of losses to yields and quality.

Foot and Mouth Disease (FMD)

An FMD outbreak can have devastating economic, social and animal welfare consequences. Defra needs to be able to contain any outbreak rapidly to minimise these effects. To help achieve this we have developed high throughput laboratory tests to improve the speed and accuracy of diagnosis of individual animals, FMD virus genome sequencing methods to track the spread of the virus by identifying the source of infected premises and methods to predict patterns of airborne spread of the virus. The rapid control and containment of the 2007 FMD outbreak demonstrates we are now better equipped to minimise the impact of this disease.

Animal Disease Epidemiology

To give an accurate indication of where and how animal diseases might spread and what the worst case scenario might be, Defra has progressively developed a surveillance information management system called Rapid Analysis and Detection of Animal-related Risks (RADAR) over the last four years. This system collates information from eleven different data sources to give vital, continually updated, quality assured information on our key animal populations, in support of epidemiological analyses, modelling and other research. It has been actively and extensively used in all the exotic disease outbreaks experienced since 2005. This system has allowed UK and European measures and policies to be targeted to areas of highest risk, thereby ensuring better value for money.

Efficient Water Use in Horticulture

Defra has funded genetic improvement programmes for crops such as strawberries, raspberries, runner beans, potatoes, tomatoes and lettuce. For example, researchers are developing irrigation strategies that produce strawberries with more consistent flavour and quality, as well as an improved shelf-life. This has both environmental and economic benefits in that production is less water intensive, crops have improved drought tolerance and the longer shelf life of food can lead to reduced food wastage.



1. Why Defra needs a strategic approach to evidence

Air Quality Impacts of Increased Biomass Heat

Using wood as a fuel is the most cost-effective form of renewable heat. However, in air quality terms, wood is a more polluting fuel than gas – particulate emissions are typically at least an order of magnitude higher.

Modelling showed that unconstrained biomass heat could have an unacceptably high impact on air quality, even at relatively modest uptake levels, leading to up to 5.2m life years lost, with a central monetised estimate of £2.8 billion per year, and making it impossible for the UK to comply with its legally binding air quality targets. Further modelling showed that, at the level of uptake predicted in the Renewable Energy Strategy, air quality impacts could be held to a low level by preferentially replacing coal and oil, targeting uptake away from urban areas and giving incentives to low emission units only.

Commitments to work towards this scenario were given in the Government's 2009 Renewable Energy Strategy and emission performance will be included as one of the eligibility requirements in the consultation on a Renewable Heat Incentive.

Ecosystem Services Framework

The ecosystems services framework was used in the Impact assessment (IA) for the Marine and Coastal Access Act. The analysis used the underlying ecosystem services framework to consider the full range of benefits that might be derived from a range of hypothetical networks of Marine Conservation Zones (MCZs). The present value of on-site benefits over a 20-year period were estimated in the range of £8.6–£19.5 billion. Although there are still challenges in properly valuing the benefits we gain from our marine environment, this represents a significant step forward in establishing a foundation of marine environmental valuation literature applicable to the UK. In addition this will be critical for the work taking place now to decide on the future of the MCZs.

Green Book Guidance on Climate Change Adaptation

The HM Treasury 'Green Book' provides the standard approach used to appraise policies, projects and programmes across Government. Defra has published supplementary guidance to help policy-makers take decisions that are resilient to the effects of climate change.³⁵ It recommends the use of a technique called 'Real Options Analysis' that incorporates the value of flexibility into cost-benefit analysis. This forms a central part of the efforts to include adaptation throughout the Government's systems.

Defra's Behaviours Research

Defra is developing a robust and respected evidence base on sustainable behaviours relevant to policy teams across the department. The Sustainable Behaviours Unit is responsible for the development of the Pro-Environmental Behaviours Framework³⁶ which synthesises the evidence on understandings of people's beliefs and behaviours towards the environment. It includes a set of insight snapshots, an innovative environmental segmentation model, best practice principles for policies aiming to influence behaviour, and an assessment of the implications for policy and communications. The framework and evidence base has been used by policy and communications teams across Defra to encourage households to take up pro-environmental actions such as saving water and choosing energy-efficient products.

³⁵ See <http://www.defra.gov.uk/environment/climate/documents/adaptation-guidance.pdf>

³⁶ See <http://www.defra.gov.uk/evidence/social/behaviour/index.htm>

2. Our plans and approaches

52. The previous section sets out the challenges and the context in which Defra's evidence investment must deliver. We need to equip ourselves with robust and comprehensive evidence to tackle the enduring big challenges of mitigating and adapting to climate change, securing a sustainable food supply, and protecting our ecosystem services. At the same time it is crucial that evidence is supplied in a timely way to meet the needs of specific policies – much of which in turn contributes to the big evidence challenges. Defra also has to meet legislative requirements for monitoring and surveillance. And we need to do all this within constrained public sector funding over the coming years. Defra cannot and need not invest in all the evidence required. The issues we care about are shared across the evidence landscape shown in Figure 2.
53. This section describes our plans and approaches to delivering increasing value for money from our evidence investments in this context.
54. Our plans to better integrate evidence across the big challenges and improve value for money over all of our evidence needs focus on five key issues:
 - Prioritising investments between policy programmes and tracking and re-prioritising our investments in the face of changing policy and financial pressures – this reflects both our policy priorities and the potential cost of and returns from investment in evidence;
 - Sharpening our focus to deliver evidence and innovation where we need it most – in both the short- and long-term;
 - Sharing investment, outputs, knowledge and expertise across Defra programmes, as well as between Defra and partners across the UK and beyond;
 - Accessing (and investing in) the appropriate range of skills, disciplines, expertise and infrastructure to provide a sufficiently comprehensive evidence base for policy now and in the future;
 - Refining the way we procure and use evidence in the Department.

Specific questions within the big evidence challenges

55. The three big evidence challenges outlined in section one are the highest priority areas for the Department and they therefore require more evidence investment to be focused on them. The interactions between these challenges are key components of our understanding of each. For example

2. Our plans and approaches

do we fully understand the links between air quality, climate change and agriculture? How is climate change impacting on our food supplies and ecosystems? How can we produce our food in ways that help us mitigate and adapt to climate change? How can we use ecosystems to help us adapt? We have highlighted below some of the other key questions and issues we will need to focus on to respond to these big evidence challenges.

56. On climate change, how do we:

- Identify the pressing gaps in the evidence base for addressing climate change adaptation and prioritise investment in these?
- Better understand the international impacts of climate change on adapting to climate change in the UK?
- Make best use of the UK Climate Projections (UKCP09) – do the UKCP09 adequately meet our needs for national level evidence? Do we have suitable models to use with the projections to enable us to assess the full range of situations, and do we have the right analytical frameworks to enable prioritisation of actions to be developed?
- Understand the combined effects and impacts of a changing climate, and changes in international movement of animals, disease vectors, animal products and people on the incursion and transmission dynamics of infectious diseases of animals and plants?
- Increase our understanding of current and projected GHG emissions in areas where there are large uncertainties – such as agriculture, land management and waste?
- Work out what opportunities there are to reduce GHG emissions in areas where Defra has influence – how much potential is there, and what might policies to unlock it cost?
- Understand behaviour and how to encourage change as we try to shift beyond encouraging mitigation behaviours across households, towards helping and encouraging households to adapt to inevitable climate change?

57. On securing a sustainable food supply, how do we ensure:

- A reliable and secure global food supply as this ultimately underpins UK availability and prices?
- We produce food in a way that is environmentally sustainable to avoid long-term problems?
- We source nutritious food from a diverse range of stable countries including the UK?
- Food security by spreading risks whilst keeping prices competitive?

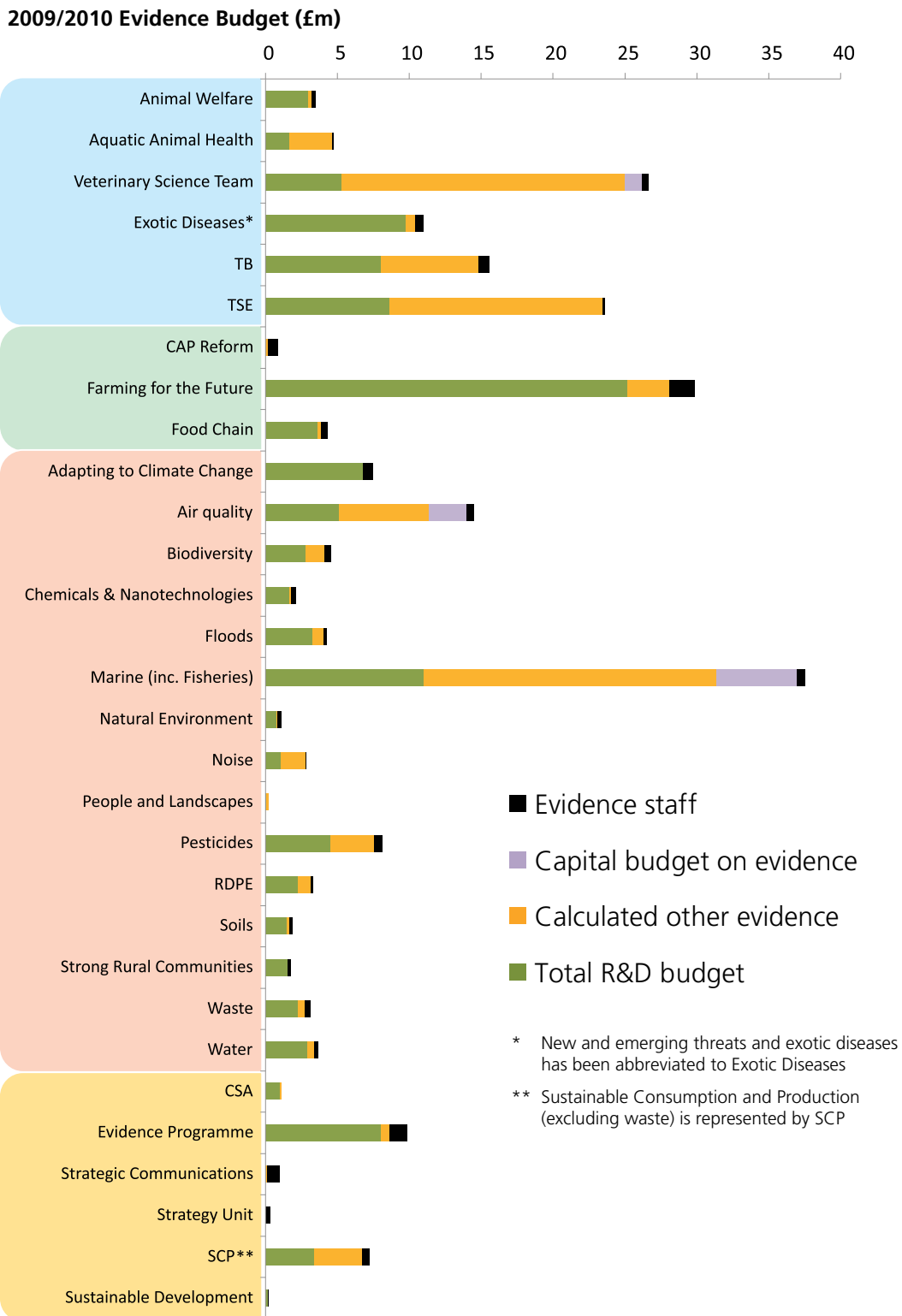
- UK food supply by having a sophisticated and complex food chain and infrastructure?
 - We have reliable energy supplies to support this?
 - Everyone has access to a healthy and affordable diet?
 - Food safety as this underpins public confidence in UK food systems?
 - We better understand people's attitudes to healthy and sustainable food?
 - We reduce waste, and water consumption throughout the food chain?
58. On protecting ecosystems services, what is our understanding of:
- How ecosystems function and the way they deliver services?
 - How societal decisions affect the delivery of ecosystem services?
 - How to value such services in a pragmatic way (either in monetary or non-monetary terms), and determine how values determined in one situation can be applied in other situations through a benefits transfer approach?
 - More effective means of engagement and participation with stakeholders?
 - The importance of the natural environment, ecosystems services and climate change in the context of people's lives?
59. Defra needs these questions addressed to meet both our overarching goals and the big strategic evidence challenges. There is already good quality evidence being collected on these challenges in the Defra evidence landscape. However, it is sometimes difficult to access all the relevant data and research on the big challenges and ensure that all of these interlinked issues are truly joined up. Defra, in partnership with others, needs to focus more on these key questions.
60. We will need to respond to these challenges through a number of channels. This needs to be both via a redistribution of funds between programmes and reorganisation within programmes. It also requires better joining up between programmes, better line of sight between evidence and policy and creating more room for innovation. How we intend to do this is outlined below.

2.1 Prioritise investments between programmes

The issue

61. The current distribution of evidence-related budgets is shown in Figure 3.

Figure 3: Distribution of evidence budget for 2009/10 between programmes (R&D, other evidence, capital budget for evidence and evidence staff cost)³⁷



³⁷ Please refer to Annex 2 for further information and the glossary for a full list of the acronyms

62. The level of investments in individual programmes is dependent on several factors. The size and type of the policy challenge is important, as is the level of relevant investment from others (e.g. Research Councils, TSB, EU, industry) and the degree to which evidence programmes are supporting the core (i.e. big evidence challenge and/or licence to operate) issues or capabilities required in the longer term and/or across the wider Department. Some expenditure reflects legislative requirements (EU and national). The process we developed to produce this Strategy tested the investments (in relation to programme budgets and people) against these broad criteria. We were assisted in our challenge by our SAC³⁸ and by experts external to Defra and from our delivery bodies. We did not make any assumptions about future changes in current Defra priorities and policies, although we did explore the Department's preparedness for known and likely future evidence needs within the current policy context.

The current situation

63. Overall, the CSA's conclusion was that current investment is largely appropriately focused and delivering useful evidence to policy programmes. There is scope for some redirection and adjustment rather than a need for wholesale restructuring. There is strong support for the view that the current level of investments will bring proportionate benefits towards the relevant policy goals.
64. Some of this re-adjustment reflects the imperatives of the three big evidence challenges and the key questions highlighted above.
65. As part of our analysis, some policy programmes were identified where changing priorities or evolution of the programme will lead to reduced evidence requirements and others where current and/or future demand is growing (see Table 2). Meeting these changed demands would not necessarily mean increasing resources. Some of this demand will be met by activity in other programmes, or the work of other partners.
66. Whilst we believe that all programmes would benefit from working more in partnership, we identified some programmes which could realise considerable benefits by sharing the investments more with industry, Research Councils or others. We also identified some programmes which may benefit from reconsidering the direction of their investments in evidence.
67. We concluded that evidence needs were growing around **climate change adaptation and mitigation**. The Climate Change Act 2008 makes the UK the first country in the world to have a legally binding long-term framework to cut carbon emissions. The Act also creates a framework for developing the UK's ability to adapt to the impact of climate change. It commits us to:
- a UK-wide climate change risk assessment which must take place every five years;

³⁸ See <http://www.defra.gov.uk/evidence/science/how/sac/subgroups/sac-ei.htm>

2. Our plans and approaches

- a national adaptation programme which must be put in place and reviewed every five years to address the most pressing climate change risks to England.

68. Some of the growing evidence challenges arise from these policy goals. Climate change is an international evidence priority for governments and research bodies. Within the UK, for example, NERC spent around £29m in 2008/9 on research (grants and contracts) on climate systems and EPSRC invested around £64m this year in grants associated with climate change. Defra's evidence needs are specifically around policy areas where Defra has to deliver in its own sectors, but also needs to be influential on other Government departments and society more generally, both nationally and internationally.

Table 2: Programmes categorised by evidence need

Growing evidence needs	Decreasing evidence needs
Adapting to Climate Change Biodiversity Farming for the Future Food Chain Natural Environment Soils Sustainable Development Water	Animal Welfare Noise Pesticides TSEs – Research
Continuing	Review or reorientation within programmes
Air Quality Aquatic Animal Health Bovine Tuberculosis Common Agricultural Policy (CAP) reform Evidence Programme Floods Marine New and Emerging Threats and Exotic Diseases Research People and Landscapes Sustainable Consumption and Production Strategy Unit Strong Rural Communities Waste	Chemicals and Nanotechnology Marine – Monitoring New and Emerging Threats and Exotic Diseases Rural Development Programme for England (RDPE) Veterinary Science Team

69. Overall we look forward to relative growth in public sector funding around **sustainable food supply**. The TSB recently announced a Sustainable Agriculture and Food Initiative, which will see public and private investment of up to £80m over the next five years in innovative technological R&D in areas such as crop productivity, sustainable livestock production, waste reduction and management and GHG reduction. The BBSRC is the UK's largest funder of bioscience with a current food security portfolio of around £185m. BBSRC is currently leading the development of a cross-Council programme in food security for Research Councils UK. This aims to provide multidisciplinary research to meet the food security challenges in crop production, livestock farming, diet and health and the societal aspects surrounding food and sustainability of the food chain. The programme is being developed in partnership across Government. Within this overall funding landscape, Defra's evidence needs in this area will reduce slightly relative to other areas, as mature research programmes on TSEs, pesticides and animal welfare demand less investment over coming years, relative to some other areas, and as we work with industry on cost and responsibility sharing on animal health surveillance.
70. Further work within Defra will determine the timing and extent of changes in these programmes, taking account of the impacts on key evidence suppliers and other key stakeholders. We see a need to shift the focus of our work on exotic animal diseases, to better reflect the current risks and allow room to explore new and emerging threats. Within this whole area of sustainable food supply we see the need to place more emphasis on new and increasingly urgent issues such as those listed earlier in paragraph 57.
71. NERC is a major investor in research and other evidence around **protecting ecosystem services**. In 2008/9 NERC spent around £31m on biodiversity-related grants and contracts and a total of around £43m on natural hazards, sustainable use of natural resources and environmental pollution. Within our Defra programmes we see increased evidence needs around research on biodiversity, soils, water, the ecosystem approach and sustainable development to support:
- Our national and international biodiversity goals, including an improved understanding of the future implications of climate change with respect to species and ecosystems, non-native species and habitats, and wildlife disease;
 - Our innovative Natural Environment programme to develop the methodology for using an ecosystem-based approach which will act as a guiding framework for Defra and beyond;
 - Better understanding of the links between ecosystems and human well-being;

2. Our plans and approaches

- Delivery of the Soil Strategy for England, including a better understanding of the factors controlling soil carbon, the resilience of soils to climate change impacts, and public attitudes to issues around contaminated land and waste spreading on land;
 - A more 'outward looking' approach to sustainable development to maximise its influence across the public sector – increased investment would allow the programme to take a more interdisciplinary approach and focus on improving the application of economics to thinking about environmental limits;
 - The development of whole catchment approaches to address diffuse pollution, and improved understanding of both the impacts of changing demand and climate on water quantity and of the behaviour and impacts of nanoparticles in water.
72. Prioritising these areas will help ensure that our investment in evidence responds to our DSOs and the new and emerging evidence challenges.
73. Across the rest of Defra's portfolio, we see a broad continuity of evidence needs around air quality, sustainable consumption and production, waste, flooding, marine environment research and people and landscapes. We want to further evaluate our evidence needs around nanotechnology in the environment, in the context of the global research effort, but we see a declining need for evidence on noise, relative to other priorities.

The plan

74. We will work within Defra business planning processes to redirect funds over time to meet the most pressing and important evidence needs across the portfolio and will review and, where necessary, reshape evidence programmes. At the same time we will continue to build and drive good practice, through the measures described in the subsequent sections.
75. In response to public sector spending pressures, Defra will need to play its part in scrutinising major blocks of expenditure to ensure spending is focused on delivering maximum value.³⁹ Both the investment in evidence and how it will be used will be part of this consideration. Our aim is to ensure we can make the necessary adjustments while reducing to a minimum the impact on evidence-based policy making in the short term and provision for our long-term needs, e.g. the stability and sustainability of key suppliers. The section on Value for Money (VfM) in Annex 1 contains advice on issues to consider in addressing such pressures. Current Defra management systems are robust enough to deliver the necessary adjustments and the existing programmes are largely in good shape.

³⁹ Public Value Program (PVP), HM Treasury, see http://www.hm-treasury.gov.uk/psr_public_value_programme.htm

76. The analyses we have undertaken in this Strategy have been in a Business as Usual (BAU) context but the lessons learned, especially about good practice, offer ways of improving VfM. Within BAU, we have presented our findings about individual programmes in a matrix of whether the evidence needs were growing, shrinking, continuing or to be reviewed. This can be adapted to increasing pressures if required.
77. We will review our large monitoring and surveillance programmes on marine and AHW issues to ensure that we continue to get best value for money. We will be guided in this in part by the work of the Environmental Observations Framework (EOF – funded through ERFF) and by the Marine Science Strategy.



2.2 Sharpen our focus to deliver evidence and innovation where we need it most – short- and long-term

Issue 1. 'Line of sight' between the evidence activities and the policy goals

78. In order to be able to value evidence investments we need a clear 'line of sight' between the evidence activities and the policy goals. We need to be able to identify the primary goals of the evidence investments if we are to be able to recognise success or failure. 'Line of sight' is in creative tension with 'cross-cutting'; the tension is resolved by being clear about the primary goals and secondary values of each investment, and the level of mutual dependencies between programmes, not by blurring the primary focus. Sometimes the questions will be very specific, sometimes a more exploratory approach is required, e.g. to develop policy options or to further understand the problem or constraints. Sometimes it will be the output or outcome of the research or other investments that will deliver the Department's needs, but on other occasions the main worth will lie in delivering expertise of value to policy-making discussion. Defra also invests in evidence to directly support its customers (e.g. farmers) and some of our investments are made partly to develop and maintain capability in areas that we know will be required over the long term. The first step in valuing all of these evidence investments is to articulate the objectives behind them and define the relationship between investment and return.

The current situation

79. Notwithstanding our general conclusions above, there is variability in the clarity of links between evidence activities and the policy priorities they underpin. This can be because either the evidence aims or policy aims are not clear. To some extent this can be captured in a good ROAME statement, with numerous benefits to be had by developing a clear line of sight between an evidence programme's Rationale and Objectives, and plans to Appraise, Monitor and Evaluate (ROAME). For example it could lead to reprioritising the evidence investments to provide greater impact, or it could provide a clearer basis on which to define relative roles and partnerships with others. In some areas, for example agriculture, the policy outcomes sought intrinsically address more than one Defra objective and the research projects are equally multifunctional. That is a considerable strength in terms of the value they deliver but makes it more challenging to establish a clear line of sight to the outcomes.

The plan

80. Through the business planning process and building on the material produced for this Strategy and existing ROAME statements, we will work with business areas to develop evidence plans around all of our major policy programmes. The evidence plan will incorporate evidence assurance, thus providing a link to wider business assurance processes in place throughout Defra, such as business cases going to Approvals Panels. These plans will clearly articulate the long- and short-term policy goals and the evidence needs that flow from these. We will also improve our information management around evidence, so that we can better monitor and review our investments across the portfolio (see section 2.5).

The variety and breadth of evidence Defra needs is vast and therefore it is not appropriate to adopt a 'one size fits all' approach. During the development of the Strategy we found many examples of good evidence practices existing and emerging in Defra.

Defra's Marine Research Programme 2009

Defra's Marine Programme is well planned and has a solid evidence base which links science to policy. Its research document recognises the need for both applied and strategic research and links marine science to key policy drivers which will influence future evidence needs to the programme. Thus the programme considers both its existing evidence and further evidence requirements for both short-term and long-term needs. This provides a clear line of sight between evidence and policy whilst recognising the wider big evidence challenges facing the Department.



The document indicates broad areas for future research with clear aims, objectives and links to policy. Combined with information on the research commissioning process and timetable, this enables the document to be a very useful tool for communicating with stakeholders.

Issue 2. Evidence assurance and business cases

81. Challenging evidence and evidence strategies needs to become an integral part of the Defra business planning and approvals process. Decision-makers need to be sure that policy proposals are soundly evidence-based and that plans include provision of the necessary evidence and analysis throughout the policy cycle.

The current situation

82. Improvements to evidence assurance are currently being rolled out across Defra activities to help support good practice and provide SROs with increased confidence in the robustness of the evidence base underpinning their policy. We are using information gathered for this Strategy to engage with business areas, providing challenge and helping teams develop their own Evidence Assurance Plans setting out how they will ensure robustness, e.g. through systematic peer reviews, expert panels, collaboration, horizon scanning, etc.
83. Procedures are in place for scrutinising business cases for their approach to evidence prior to their consideration by Defra's Central Approvals Panel. At present there are not sufficient resources to provide the same input to Local Approvals Panels.

The plan

84. We will:
- Provide guidance and assistance to business teams on how to embed effective evidence assurance within their programmes (see Annex 1);
 - Seek to extend our ability to advise both Local and Central Approvals Panels on business cases;
 - Develop proposals on how best to brigade the Evidence Programme resources to optimise our assistance to business areas on embedding the recommendations of the Strategy and providing a challenge to the evidence base of policy proposals.

Issue 3. Driving more innovation into policy and towards our outcomes

85. Defra has the stated aim of being a 'hive of policy innovation' and a leader of policy innovation in Whitehall. That means delivering our outcomes in more cost-effective ways and in ways that work with the grain of business and people's lifestyles and aspirations. We also need to recognise that delivering our DSOs and providing sustainable solutions to the big challenges will require radical or even transformative innovation in society and the economy. Sustainability will require far-reaching changes on individual behaviour and social organisation as well as new technologies.

The current situation

86. Some of Defra's evidence investments are aimed directly and deliberately at developing innovative solutions or options. For example, within the farming for the future programme, there is work to develop new crop varieties to adapt to a changing climate and new technologies and practices to reduce GHG emissions within an economically sustainable farming sector. Other innovations are driven through our delivery bodies such as WRAP and the National Industrial Symbiosis Programme (NISP). The tendency has been to invest in relatively low-risk and hence incremental innovation. However in the face of severe financial and pressing environmental challenges, we need to be more risk-taking in our investment, changing our thinking, our processes and our culture if we are to deliver our outcomes and respond to our big challenges. We need to create the opportunities and motivations that will enable our staff and our partners to develop and test new ideas, and to recognise that significant gains will require a higher appetite for risk in investment plans.

The plan

87. To improve our performance on innovation we plan to:
- Expand the role of the Defra Evidence Forum to include a space for innovation to create networks, build competence around innovation and share learning;
 - Create a space in the Evidence Programme budget to exploit new ideas and innovative pathways;
 - Examine the case for an annual CSA's innovation team award for the most innovative evidence solutions to raise awareness of the importance of innovative approaches and help encourage behaviour change in Defra;
 - Develop our partnership programmes so that they foster more innovative research;
 - Build on our relationship with TSB, and our experience in NISP and WRAP, to promote more radical and transformative innovation;
 - Use our procurement of evidence to drive more innovation.

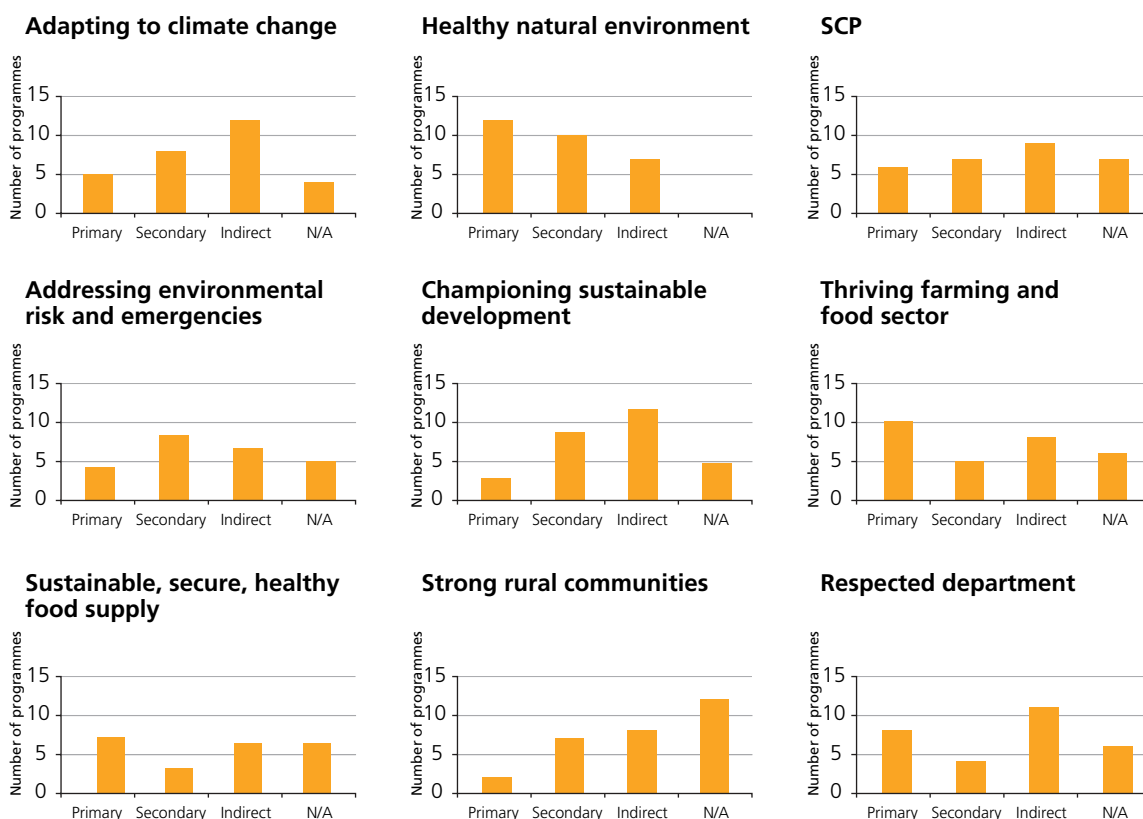
2.3 Increase co-operation using partnership working to share the investments, knowledge and expertise

Issue 1. Joining-up across programmes to create a coherent evidence base for each of the big challenges

The current situation

88. We have identified three enduring evidence challenges that cut across the policy boundaries of the Department. The evidence contributing to these challenges is spread across the Department, e.g. research on adapting to climate change is partly funded under the policy programme of that name, but also through parts of the farming and water programmes and elsewhere. Currently the links between these programmes are weaker than the links within them. Our solutions should provide a more robust and comprehensive evidence base for Defra and will:
- Recognise that evidence investments need to contribute to both the long-term big challenges and the shorter term, more narrowly focused issues;
 - Encourage interdisciplinary working that allows us to assess options and impacts across people, economies, industries and ecosystems;
 - Foster better communication and coordination across current boundaries so that gaps can be plugged and synergies exploited;
 - Ensure better coordination and influence with relevant bodies outside Defra – to develop a true ‘UK evidence base’ across the broad themes;
 - Promote data sharing on the ‘collect once, use many times’ principle, improving access through programmes of cataloguing and metadata.
89. Figure 4 shows that all of Defra’s nine DSOs are delivered by multiple programmes. The charts show how strongly programmes considered themselves to be responsible for the delivery of each of Defra’s DSOs. Programmes were asked if they considered themselves to be primarily, secondarily, indirectly or not responsible (N/A) for delivery of each DSO. All programmes assessed were responsible for delivery of more than one DSO.

Figure 4: Links between Defra Programmes and DSOs⁴⁰



The Plan

90. We will:

- Use our Evidence Forum to encourage creative discussions between teams at the working level, including through one day workshops around each of the three big challenges – these workshops will be an opportunity for policy and evidence specialists to showcase the work they are undertaking and discuss knowledge needs around the big challenges;
- Create a light-touch overarching challenge process overseen by the CSA with expert input to bring together all the relevant work, identify gaps and synergies, and ensure the whole adds up to more than the sum of the parts – this should extend as appropriate to other partners in the Defra evidence landscape;
- Work with the Defra Data Sharing Programme to ensure that policy programmes are aware of and making best use of existing data sources, and maximising VfM through ensuring collection and sharing of data from their own programmes;
- Factor assessing VfM into challenges to business plans and cases within normal Central Approval and Local Approval Panel processes (Annex 1 gives a fuller explanation).

⁴⁰ Please refer to Annex 2 for further information and the glossary for a full list of the acronyms

Issue 2. Improving our engagement with others, in particular Research Councils, LWEC and the EU

The current situation

91. Defra investment in evidence is just one piece of a jigsaw of funders that direct efforts towards the environmental, societal, rural and sectoral issues covered by our remit. In the UK, the Research Councils, TSB and other Government departments, agencies as well as some industry sectors, invest at least as much as we do ourselves.
92. ERFF was established in 2003 to coordinate activities across all of the relevant UK public funders and to facilitate the sharing of plans, priorities and outputs. ERFF's EOF⁴¹ is undertaking an important exercise to ensure maintenance and accessibility to long-term and synoptic environmental data sets.
93. In 2008 the LWEC initiative was launched with the aim of drawing in £1 billion R&D investment over five years towards: climate change; sustainable ecosystems; sustainable development and food and water supply; plant and animal health; built environment; and social and cultural aspects of environmental change.
94. TSB has recently announced a new five year Innovation Platform for agri-food with funding of up to £80m, including £30m from Defra and a contribution from BBSRC available for joint funding with industry. This builds on and will replace several existing LINK programmes sponsored by Defra and others in the agriculture and food areas. These activities have been very successful in bringing together academic researchers and industry partners.
95. In Europe the 7th Framework Programme (FP7) for R&D is investing around €4 billion over the seven years to 2013 towards environment and food, farming, fisheries and biotechnologies.⁴² A significant innovation funded by FP7 and its predecessor is the coordination of national research programmes under the European Research Area Network (ERA-Net) scheme. These networks support an evolving set of activities from information exchange through to the joint funding of projects. Defra is actively involved in a number of ERA-Nets, e.g. EMIDA (Emerging and Major Disease In Animals), BiodivERSA (biodiversity research) and Marifish (marine fisheries). We also participate in the Standing Committee on Agricultural Research (SCAR), which plays an increasingly important role in developing the agenda for European agricultural research.

⁴¹ See <http://www.erff.org.uk/activities/uk-eof.aspx>

⁴² See http://ec.europa.eu/research/fp7/index_en.cfm

96. LWEC and ERFF provide huge opportunities for all funding partners to better understand, coordinate and share the investments we all make towards our common goals. FP7 money provides opportunities to widen the expertise base, from which we draw our evidence, develop shared evidence and agendas across the EU and add to the national efforts. As pressures grow on public finances, it will be increasingly in the interests of all funders to work together on the top priority issues facing society and the economy. The corresponding risk is that, as each funder comes under pressure, there will be un-coordinated decisions which will result in long-term damage to capability.

The plan

97. We will:
- Work to achieve a fully functioning ERFF with effective processes for members to share information on their programmes and their outputs and to jointly debate and agree future priorities;
 - Working with ERFF's EOF, the UK Location Council and other bodies ensure the maximum value is derived from environmental observations and data series;
 - Increase efforts to engage with LWEC, in particular by increasing the proportion of our evidence that is co-funded with LWEC partners;
 - Work pro-actively with our delivery partners, the Research Councils and others to explore and articulate the areas where we could most productively work together, and ensure mechanisms are in place to facilitate this;
 - Ensure the major programme evidence plans (section 2.2, paragraph 80) show how the evidence that we commission fits with the work of other research funders;
 - Ensure major policy areas have access to external expert challenge to identify goals and synergies;
 - Continue to support the developing European Research Area and other international activities through, in particular, participation in FP7 'Food, Agriculture & Fisheries, and Biotechnology' and 'Environment' themes;
 - Continue appropriate coordination of research agenda with other countries through mechanisms such as ERA-Nets.

Issue 3. Improving knowledge exchange where evidence is aimed directly at customers

The current situation

98. We are the primary customer for most of the evidence in which we invest. However, a significant proportion of our evidence is also aimed at industry or other customers. To be effective these activities need strong customer involvement from the start, including an analysis of their 'readiness to adopt' and dedicated resources to transfer the outputs to customers to try and ensure maximum uptake and impact. Defra's current involvement, e.g. through LINK programmes and the TSB, is helpful in this respect. However, we want to improve the targeting and impact of our customer-facing evidence towards our shared goals.

The plan

99. In order to target our efforts more effectively in these customer-facing areas we will:

- Clearly identify and review industry/customer-facing projects and programmes;
- Jointly develop and evaluate these programmes with the customer;
- Ensure a proportion of our evidence budgets are devoted to knowledge exchange;
- Recognise and reward good practice in the communication of evidence.



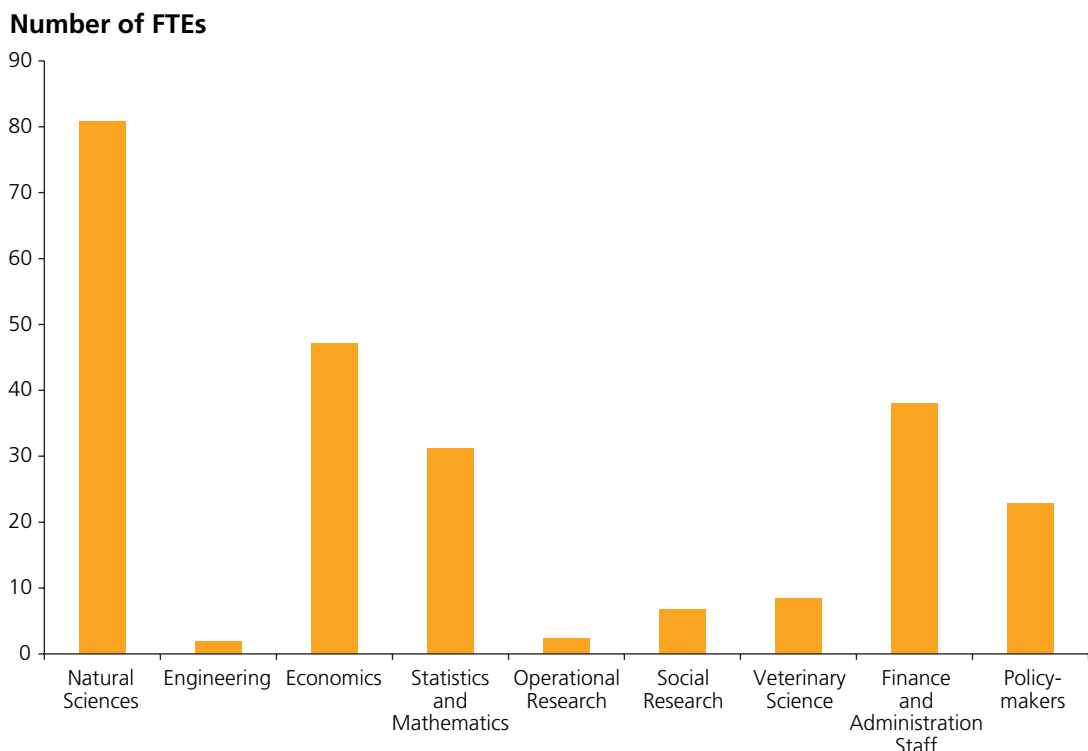
2.4 Develop and organise the right skills, expertise and capabilities

Issue 1. Resource and career planning for specialists in Defra

The current situation

100. Around 10% of the staff effort⁴³ within core Defra is on evidence and there is wide variation in the amount and type of specialist effort on different programmes (see Figure 5). To date no strategic evaluation has been carried out about numbers and roles of specialists in the Department or of their career paths. An early priority for our specialist career homes will be an analysis of current and future workforce planning needs. This analysis will include an examination of the use of secondments, fellowships and short-term contracts as adjuncts or alternatives to permanent staff, particularly in relation to our need for experienced, mid-career deep specialists. It will also examine means of improving career movement between core Defra, our specialist agencies and other partners.

Figure 5: The distribution of the 239 Full Time Equivalents (FTEs) currently working on evidence according to specialism⁴⁴



⁴³ Defined using FTEs, rather than based upon headcount. A greater proportion of staff are specialists, but FTEs captures the amount of time they spend on evidence related activities.

⁴⁴ Please refer to the Annex 2 for further information

The plan

101. To ensure the most cost-effective access to the skills and expertise Defra needs in the short and long term we plan to:
- Work with the career homes and the workforce planning team to ensure we have the right mix of flexible skills to meet Defra's needs, including the use of internal secondments and more interchange between Defra and our agencies and through an appropriate balance of early- and mid-career recruitment – this implies a more managed approach to the deployment of specialists;
 - Work with career homes to improve understanding and common working between the analytical professions (social, veterinary and natural scientists, economists and statisticians).

Issue 2. Expertise in the Department

102. Responding to our challenges requires a diverse range of expertise to ensure that we capture all the issues and avoid pitfalls. Some of this expertise needs to be in the core Department, guiding policy during its development and working closely with the research community based outside the Department by creating and maintaining excellent networks with specialists.

The current situation

103. The analysis of the information provided for the Strategy and comments made by the external capability review has provided some evidence that there are areas of shortage of specialists within the Department. This includes engineers, geographers and operational researchers. The latter are already involved in some policy programmes which deal with highly complex issues (e.g. Adapting to Climate Change and Floods Programmes), as well as at the centre of the Department. However, there is potential for more use of operational research approaches and operational researchers across some of the other challenging and complex areas such as Animal Health, Food Policy or Sustainable Consumption and Production.
104. In particular the analysis placed a strong emphasis on the need for more social scientists – 25 of the 29 programmes stated they would benefit from additional social research expertise or wanted a better understanding of social research, especially as the profile of 'behaviour change' rises in the wider policy agenda. This would suggest the overall requirement may amount to between 15 and 20 FTEs within the next three years.

105. Analysis of the information provided for the Strategy gives a closer understanding of the resource that may be required to more fully address social research requirements as well as where expert social researchers might add value:
- In the absence of social research input to widen the agenda, SROs tend to focus social research on the 'end of pipe' questions such as how to better communicate and engage with people to influence a behavioural outcome rather than gaining understanding of the audience/customer from the start;
 - Some requirements for social research are likely to be generic, e.g. understanding underlying causes of behaviour, motivations to take up new behaviour and barriers to change;
 - A number of SROs told us they would benefit from an increase in social research input into their programmes, but would prefer a central pool of social researchers that they could draw on, on a project-specific basis.
106. Defra also undertakes an increasing amount of customer insight work, which primarily draws on social research. Training is being provided to Defra staff to ensure customer insight becomes an integral component of evidence gathering for new policies and initiatives.



107. Defra has accepted that social research is under-resourced in the Department, but until now it has had consistent problems in rectifying this position given the difficulty of opening up space for new recruitments.
108. There is also a need for policy-makers to be able to better understand the types and uses of evidence on offer, its limitations and uncertainty and how best to engage with colleagues from the analytical career homes.

The plan

109. We will:
 - Immediately appoint a Senior Civil Servant (SCS) level head of the social research profession;
 - Immediately seek approval to appoint five new social research posts to be managed in central and existing semi-embedded teams – this will provide a deployable resource to enable SROs to address key urgent evidence needs;
 - Instigate a resourced programme to raise analytical understanding for SROs and their deputies – this should be built into senior management training and development schemes and focus on increasing understanding of all analytical professions;
 - Through the business case challenge process, agree workforce planning targets to ensure Defra has sufficient access to social researchers in the medium to long term;
 - Through the business case challenge process, assess the needs for other areas of expertise and feed this into workforce planning in Science and Engineering, Veterinary and Economics, Statistics and Research Career homes (SECH, VetCH and ESRCH).

Issue 3. Maintaining and building key external capabilities

110. Defra has a particularly wide and diverse range of responsibilities and relies on a broad range of different kinds of evidence and expertise from outside the Department to support its work. Defra must be able to undertake research, draw on unbroken long-term datasets, make use of specialist facilities (e.g. disease diagnostic laboratories) and work with delivery bodies to develop and implement policies. Some of these capabilities are common and can be sourced when needed. However, others that are important to Defra's remit are not so widely available and may be dependent on Defra funding. For these capabilities longer term planning is needed. In the past these capabilities were not systematically identified and monitored. Thus in order to manage these 'strategic capabilities' appropriately Defra commissioned a review to:

- Review Defra’s strategic requirements for evidence and expertise and identify associated external capability needs now and in the future, including special facilities and long-term data sets;
- Characterise/identify strategic capabilities that meet these needs.



The current situation

111. This provider-led review was carried out by a consultancy firm and published in January 2009.⁴⁵ It provided a thorough, although incomplete list of capabilities and presented some generic messages. The review was from the perspective of the providers rather than from the users of this evidence, so should therefore be considered as a useful, but incomplete, picture of important capabilities.

The plan

112. This Strategy has carefully considered the findings of this capability study. We will seek to protect the most important strategic capabilities. Furthermore, many of the key issues raised by the external capability review have already been addressed by other recommendations, for example enhancing multidisciplinary working (particularly improving join-up between statistics, economics and social science), prioritising long-term and cross-cutting research and addressing specialist skill shortages and training needs.
113. However, given the increasingly challenging financial climate, it is likely that key evidence funders, including ourselves, will have to prioritise investment in evidence which may have an impact on external capabilities. We will try to minimise any resulting adverse effects by:
- As a first step discussing the findings of the report with internal users of the evidence to agree on the most important and strategic capabilities;
 - Working with key delivery agents and stakeholders to discuss and implement solutions, particularly around skills, partnership working and managing capabilities – in particular we will want to assess the relationships and impacts across similar capability studies undertaken by BBSRC, NERC, the SG and others;
 - Adopting an appropriate and proportionate approach towards assessing and monitoring changes to key capabilities.

⁴⁵ See <http://www.defra.gov.uk/evidence/science/how/documents/defra-external-capability-project-final-report.pdf>

2.5 Refine our processes

Issue 1. Embedding evidence more into business processes

The current situation

114. Decisions on prioritising budget allocations within policy programmes are delegated to SROs with regular checks through the submission of business cases to approval panels. The CSA, assisted by other heads of profession, has an important role in providing challenge to those decisions. This serves several functions: ensuring the quality and improving the use of evidence in Defra; taking a strategic overview to ensure the key challenges and approaches are being adequately addressed; helping to prioritise evidence needs; and suggesting alternative methods of evidence gathering.
115. The preparation of this Strategy has demonstrated the need to improve Defra's ability to track evidence investments and activities.
116. At present the CSA is consulted on proposals to let new R&D contracts. This provides an effective and efficient challenge function on a project by project basis, but only for R&D.
117. However, there is currently no parallel systematic process to allow the CSA to provide challenge on strategic decisions on evidence at policy programme level. The recommendations already outlined in section 2.2 will help towards filling this gap from the bottom up. Programme-level evidence strategies and enhanced assurance of business cases going to approvals panels will create opportunities to provide challenge as part of the regular business processes associated with the Policy Cycle.
118. Even so, the CSA is not routinely consulted on adjustments to evidence budgets within SRO's existing delegations. This could become a significant issue as budgets come under increasing pressure over the next few years.

The plan

119. We will ensure we have the right processes in place to ensure the CSA has the opportunity to provide timely input to decisions to re-prioritise evidence budgets in the face of changing policy and financial pressures. We will make sure these processes are in line with existing Defra management processes and do not add unduly to burdens on the business. Specifically, we recommend that:
 - The CSA should be consulted on all significant adjustments to evidence budgets, plans and activities (the CSA will coordinate with other heads of profession as appropriate);

2. Our plans and approaches

- A code for evidence activities be inserted into our financial systems so we can easily identify and track evidence spend;
- An evidence component is built into Defra's corporate performance indicators reported on by each programme;
- The existing CSA approvals process for R&D contracts is extended to cover all evidence contracts.

Issue 2. Evidence procurement processes

120. We need to review the procurement and use of evidence in Defra, particularly in light of the greater emphasis we will place on working with other funders. Unless we get the process of commissioning and managing evidence right, it can significantly reduce the effectiveness of our specialist staff and the value for money we derive from our programme budgets.

The current situation

121. Defra evidence specialists are advised and assisted by the Department's procurement and legal experts. Standard procedures and templates for procuring science R&D contracts are contained in the Defra Science Handbook. Over time a variety of additional steps have been added to the procurement process.
122. The Science Information System (SIS) database is the repository for information on all Defra's R&D contracts. However, it has incomplete coverage of Defra's non-R&D and non-natural science evidence, and is hampered by complex interrogation functions.
123. Some evidence specialists spend large amounts of time on procurement and contract management issues rather than focusing on the evidence and its contribution to policy. This is clearly not a good use of their skills. There also appears to be a lack of clarity about procedures to be used for non-natural science and non-R&D procurement – most use procedures based on the Science Handbook, but it is not clear that all evidence contracts are managed this way.
124. Inefficiency results from the need to use different management systems in parallel, often with limited ability to communicate with one another. This often leads to evidence programme managers inventing their own bespoke systems to track budgets, commitments and payments.

The plan

125. It is now time to review our practices for evidence procurement and its subsequent use to try to address these issues. This review will need to balance the desire for flexible and innovative approaches to procurement and contract management with the need to ensure good practice and legal compliance. It will also need to take into account the legitimate need for a variety of models and methods to meet different business needs.
126. We must also ensure we properly manage our data. While we aim to make data publicly available wherever possible, we also need to be aware of legitimate reasons for confidentiality. We need to identify and manage the risks to the confidentiality, integrity, availability and security of our data.

We need to ensure we both protect and use the information with which we are entrusted.

127. We will:
 - Revise the Science Handbook, extending its coverage to all forms of evidence procurement, and include updated examples of good procurement practice and data management;
 - Consider the respective roles of evidence specialists and procurement Advisers, revising the current arrangements if necessary;
 - Seek opportunities to streamline current procedures to allow specialist staff to focus on the evidence and its contribution to policy;
 - Review the Department's contract management systems (particularly SIS) with a view to linking systems;
- Consider the role of new initiatives such as Buying Solutions⁴⁶ in helping to streamline procurement processes;
- Introduce basic procurement and use of evidence training tailored to the needs of evidence specialists.

⁴⁶ The Office of Government Commerce's Buying Solutions is the national procurement partner for UK public services. See <http://www.buyingsolutions.gov.uk/aboutus/>



3. Next steps

128. The development of the Strategy has been an iterative process involving business areas, evidence teams, expert advisers and external stakeholders. This collaborative/challenge approach has been of value in developing a wider appreciation of the evidence needs and the ways to gain VfM from the investment, and has yielded a number of recommendations which have been presented in previous sections.
129. We will continue to work closely with Defra colleagues and our partners to develop a detailed **implementation plan**, which will be produced in **spring 2010**. This plan will deliver the envisaged culture change for evidence. It will also optimise the value we get from evidence by integrating our recommendations into existing processes, such as business planning, business assurance and career planning.
130. We must respond proactively to ensure we meet Defra's challenges for evidence now and into the future. Although consideration of future direction is an ongoing activity, Defra's Evidence Investment Strategy should be reviewed in 2012 to ensure our strategic direction for evidence remains optimal. This will help us both maintain our reputation in Government for being 'the first with the best evidence' and achieve our aspiration of being a leader in Whitehall on policy innovation.

Annexes

Annex 1: Good practice in using evidence

This annex describes how the evidence gathering process operates and provides input to policy. It introduces the concept of an Evidence Cycle that sits alongside the Defra Policy Cycle. It includes:

- A description of the current arrangements;
- A set of cross-cutting core principles for evidence;
- The identification of the key elements of gathering evidence;
- An outline of good practice approaches.

The guidance described here is consistent with the recently published Overview of the Government's Approach to Science and Engineering in Government.⁴⁷

Managing evidence in Defra

The functions of Defra's evidence specialists vary. They may themselves be experts in their own right on the issue, or they may be acting in an interpreter role, using their skills to form a bridge between external deep specialists and internal policy-makers. Either way, they need a range of skills beyond their core professional qualifications and their skills in research and data gathering contract management. In particular, they need well-developed policy-making skills and a high level of competence as communicators (between their specialist community and policy-makers) and networkers. The function of evidence specialists will depend in part on the stage the work has reached within the evidence and policy cycles.

In Defra's Programme and Project Management approach SROs are allocated staff and budget resources to deliver specified outcomes. Defra's evidence specialists and the budgets they manage are an integral part of those resources.

The first task of an SRO in taking on a new policy issue is to organise a diverse team, drawing in the expertise and experience needed to address all facets of the problem. They need to assure themselves their business plan encompasses the necessary level of expertise to underpin their outcomes. Most of Defra's issues are complex and need multidisciplinary teams working together to provide inter-disciplinary analysis covering economic, social and natural science inputs (often encompassing an array of sub-disciplines), enabling us to examine and/or challenge evidence from a range of sources.

Specialist Deputy Directors lead teams within each Group. Their job is to ensure coordination across each discipline over the related policy areas *within* the

⁴⁷ See <http://www.dius.gov.uk/~media/publications/GO-Science/GO-ScienceSEG>

Group. They also have an important role aiding coordination between Groups and coordinating between specialists. They play a key role in deployment of appropriate expertise to policy programme teams, in conjunction with the specialist Career Homes (Science and Engineering, Veterinary, and Economics, Statistics and Research). These Career Homes are responsible for career development and managing performance appraisal for their staff.

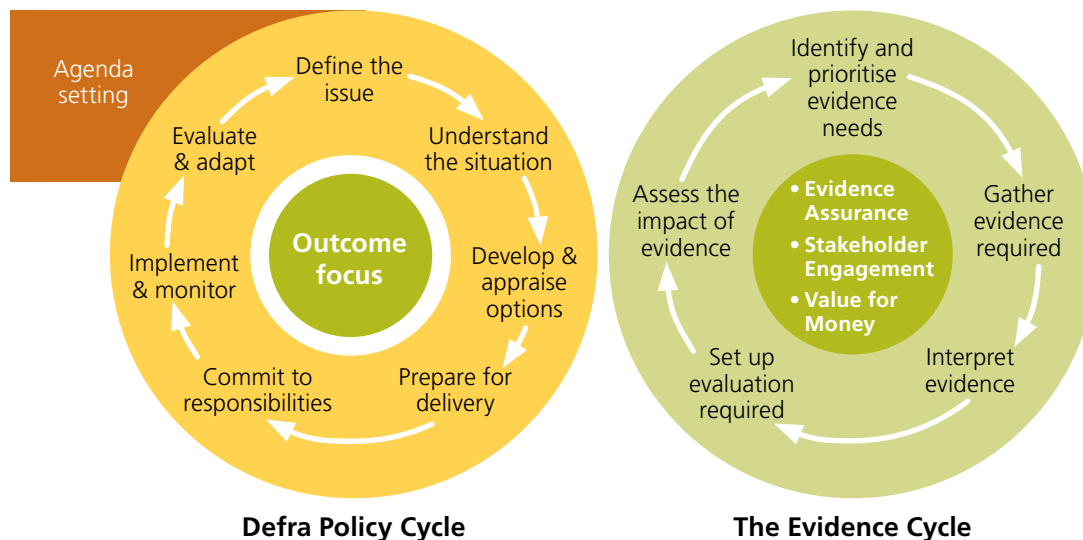
The CSA champions evidence and evidence-based policy making at Defra Management Board level. The CSA is supported by his secretariat and by the Evidence Programme (part of SEG), which is responsible for ensuring the quality, VfM and overall direction of evidence investment by the Department. The Evidence Programme's work includes:

- Strategic analysis including drafting this Strategy and coordinating its implementation;
- Developing strategic relationships with external funders to help Defra programmes coordinate their research to support evidence needs;
- Helping assure evidence used to underpin policy and providing guidance on evidence gathering and evaluation processes;
- Providing Defra's centre of expertise on horizon scanning and futures; and
- Managing the Evidence Forum – a discussion body bringing together specialists and policy-makers across Defra to discuss cross-cutting evidence issues.

The Policy and Evidence Cycles

The Policy Cycle identifies key stages in policy development, each of which is underpinned by evidence. In particular the Policy Cycle identifies decision-making stages where Impact Assessments (IAs) must be undertaken. IAs provide a key mechanism for articulating the evidence underpinning policy decisions taken by Ministers. The Evidence Cycle (Figure A1) sets out the considerations to be taken into account in gathering and using evidence throughout the Policy Cycle.

Figure A1. The Policy and Evidence Cycles



The links between the cycles

Understanding the interaction between the Policy Cycle and the Evidence Cycle helps drive the policy direction and ensure innovation in both evidence gathering and policy development.

The first point to note is that the Evidence Cycle sits alongside *all* points of the Policy Cycle – so stage one of the Policy Cycle (Define the issue) maps onto several stages of the Evidence Cycle. The maturity of the evidence base and policy area determines the speed of progression around the Evidence Cycle. For a policy area with an unfamiliar and emerging evidence base, it may be necessary to undertake the full course of the Evidence Cycle at each stage of policy development. Where there is a mature evidence base underpinning an established policy area, some stages may require only brief examination, but should nevertheless be given due consideration to ensure previous conclusions still hold true.

Cross-cutting elements applying throughout the Evidence Cycle

Each phase of the Evidence Cycle incorporates a number of features against which good practice can be assessed. Cross-cutting aspects at the centre of the diagram in Figure A1 – evidence assurance, stakeholder engagement and value for money – are crucial at all stages. Delivering value for money will be even more important in the context of the likely reduction in overall budgets over the coming years.

Evidence assurance provides challenge on the robustness of the evidence base. It ensures that evidence activities are conducted in a rigorous and reliable way and that conclusions derived from them have a sound basis. Evidence assurance can also help assess whether plans for further evidence gathering and analysis are comprehensive and fit-for-purpose. It can also challenge whether independent expert views, innovation, inter-disciplinary collaboration and horizon scanning have been properly considered.

Why Evidence Needs Assuring

Most business cases will be underpinned by an evidence base developed in conjunction with relevant specialists. SROs are responsible for demonstrating the robustness of this evidence. Approvals Panels review and challenge business cases at appropriate stages of the Policy Cycle and will consider evidence assurance.

Types of Evidence Assurance – include independent expert advice, consideration of what robust evidence is already available, innovation, collaboration and formal quality assurance standards. Periodic assurance will involve detailed peer review by independent experts. There are well-established systems in place to *peer review evidence*, giving impartial advice on the quality of the evidence gathered, where gaps in knowledge exist or where improvements can be made to the evidence base. This adds rigour to the policy process, guards against charges of bias or selecting only favourable data and assures the quality of project proposals or project final reports at both individual project or programme level. For instance:

- Effective peer review of outputs gives added confidence in the robustness of the evidence and plans for filling key gaps;
- Rigorous consideration of project proposals and ensuring that external contractors adhere to the *Joint Code of Practice for Research*⁴⁸ and other accreditation schemes can also help improve the quality of evidence;
- Review of proposals or outputs by relevant independent *Expert Advisory Groups or Panels* can also give added assurance;
- By *signing off research proposals* before contracts are let, the CSA gives Ministers confidence that new evidence investment is both robust and policy-relevant.

Each business area will be developing an **Evidence Assurance Plan**. This will outline the activities conducted to date, priorities for new activities and the appropriate timelines. The plans plan aims to embed good practice in evidence assurance, to support development of the existing evidence base and identify opportunities for partnerships and innovation. The Evidence Assurance Plan forms part of the Evidence Plan each programme is preparing (see Section 2.2), providing a link to wider business assurance processes in place throughout Defra.

⁴⁸ See <http://www.defra.gov.uk/evidence/science/how/documents/JCoPRGv02-04.pdf>

Wider evidence assurance is also required at all stages of the Policy Cycle. For instance:

- 'Agenda setting' to 'Defining the issue' phases: Do you have the full range of evidence/expertise that you need? Who will you consult externally to ground-truth your knowledge of the evidence? What does the evidence tell you about the policy issue (have you comprehensively reviewed the literature and consulted experts familiar with these issues)? It is important at this initial stage to keep your questions open and avoid framing the issue too narrowly at first. It is also important to begin identifying success measures for later evaluation of impact from this phase.
- 'Defining the issues' to 'Develop and appraise options' phases: Is the proposition on which the policy proposal is based well-evidenced? How do you know your chosen options will deliver the desired outcomes? How will you obtain innovative ideas about potential solutions and how will you assess their practicability? What plans/investment will you need to put in place to obtain further evidence required at later phases of the cycle?
- 'Develop and appraise options' to 'Implement and monitor' phases: What further evidence will you need to be able to implement these options? How will you test their likely effectiveness and VfM? Do you need to review your policy against the emergence of new evidence?
- 'Implement and monitor' to 'Evaluate and adapt' phases: How will you evaluate the effect of the policy and on the basis of what evidence? How will this evidence be collected? Will it require any special technology/facilities/skills and if so, who will provide these?

Stakeholder engagement – engagement with those who can help to frame the issues comprehensively and/or point to sources of evidence with which we may not otherwise be familiar is extremely valuable.⁴⁹ This helps avoid the problems of knowledge of which others are aware but we are not. Stakeholders can be both internal and external to Defra and its network. Good practice on stakeholder engagement includes the need to:

- Identify, map and engage with appropriate stakeholders;
- Ensure an appropriate mix of internal and external capabilities;
- Use existing Advisory boards where possible – where this is not appropriate, consider setting up a temporary Advisory board or more informal group for the likely lifetime of the work involved;
- Ensure internal evidence experts fully engage in open effective dialogue with the widest possible external evidence community and networks to obtain specialist knowledge (see the example on ecosystem services in the next text box);
- Identify inter-dependencies with other programmes (internal and external);

⁴⁹ See the Evidence Landscape in Figure 2, Section 1 of the Strategy

- Look for opportunities to collaborate with external sponsors of evidence to lever additional funding on the questions of interest to Defra policy.

Understanding and assessing risk is a subset of stakeholder engagement. To be sure that evidence fully addresses short- and long-term policy needs and thus meets our big challenges and DSOs, we need to understand the current risk state of a particular policy or cross-cutting policy issues. High decision stakes and high ambiguity, uncertainty or ignorance requires interdisciplinary working involving specialists, stakeholders and experts from other disciplines. The Risk and Regulation Advisory Council's Practical Guide to Public Risk Communication⁵⁰ outlines key activities that will help staff adapt their standard processes to achieve effective risk communication. It is designed to supplement the excellent and comprehensive guidance that already exists on risk communication in government.

Public and media understanding of uncertainty within evidence is important to help gain co-operation and acceptance of policy decisions made. The use of appropriate methods to examine and assess both long- and short-term risk provides insight that can drive innovation and is crucial to the development of an array of policy options and the identification of further evidence needs.

Participatory and Deliberative Techniques – an Example

Defra has commissioned a study assessing participatory and deliberative approaches to ecosystem services decision making. The study will identify the most effective techniques for engaging with a wide range of stakeholders at national, regional and local level, to help embed an ecosystems approach and improve decision making. The project follows actions identified in *Securing a healthy natural environment: an action plan for embedding an ecosystems approach*⁵¹ and *An introductory guide to valuing ecosystem services*,⁵² both published by Defra in 2007.

The project will produce guidelines to help decision-makers and analysts use appropriate participatory and deliberative techniques. It will also seek to establish the contribution that participatory methods can make to improve the way in which non-monetary costs and benefits (quantitative and qualitative) are taken into account alongside monetised costs and benefits at key points in decision making, such as appraisal.

The project is also an excellent example of interdisciplinary research. The study was developed by Defra economic analysts, social researchers and their policy colleagues and is being taken forward by academics with expertise in ecosystem science, participatory and deliberative processes, and environmental economics.

⁵⁰ See <http://www.berr.gov.uk/files/file51458.pdf>

⁵¹ See <http://www.defra.gov.uk/wildlife-pets/policy/natural-environ/documents/eco-action-exec.pdf>

⁵² See <http://www.defra.gov.uk/wildlife-pets/policy/natural-environ/documents/eco-valuing.pdf>

Value for Money (VfM) is a key criterion for deciding what evidence Defra should commission. Good practice on VfM covers both tools and principles.

VfM Tools: The HM Treasury's Green Book⁵³ provides a good high level guidance that can act as an organising principle for *ex ante* appraisal of VfM. The Cabinet Office's Magenta Book⁵⁴ covers the equally important issue of *ex post* evaluation of the impact a policy investment has had.

VfM incorporates relevance, excellence, timeliness and fitness-for-purpose. However, determining VfM for evidence contributing to policy is by no means straightforward. While the policy outcome is usually amenable to valuation, the contribution made by different pieces of evidence can be hard to quantify. It can take some time, even years, for a policy based on a particular piece of evidence to deliver the originally intended outcome. The source of the evidence, or the amount of resource invested in the work, may be difficult to trace or source when it finally comes to fruition.

Despite these difficulties, there is still a need to appraise likely outcomes and benefits from the investment in evidence to aid decision making and prioritisation of evidence needs. So Defra is developing a semi-quantitative tool to assess VfM of evidence projects and programmes. This will be trialled and, if suitable, rolled out to policy programmes in early 2010.

VfM Principles: Over the coming years, there is likely to be increasing pressure on budgets for procuring evidence. To minimise the impacts of reductions in budgets available for evidence gathering, programme managers can, e.g.

- Increase funding through partnerships – co-operate with others, across Defra and externally, to get best VfM out of reduced budgets;
- Be rigorous about carrying out secondary research (e.g. meta-analyses and literature reviews) and using expert opinion, working groups or Advisory committees, which may be better value ways of delivering evidence and advice in the short term; only where secondary research identifies real gaps in knowledge should primary research be initiated;
- Make greater use of R&D investment by using contractors as sources of timely advice while their contracts are running;
- Re-examine monitoring mandated by EU or national law for:
 - Gold-plating – can we reduce coverage, precision, scale?
 - Opportunities for technical improvement – e.g. long term, can we persuade the European Commission to 'adapt to technological improvement'?
 - Innovative cheaper ways to undertake the monitoring, through improvements in technology or in statistical design;
 - Cost-sharing opportunities (many monitoring and surveillance programmes already fall in this category).

⁵³ See http://www.hm-treasury.gov.uk/data_greenbook_index.htm

⁵⁴ See http://www.civilservice.gov.uk/Assets/Intro_Magenta_tcm6-8601.pdf

To enable us to be effective at secondary analysis, it will be particularly important to:

- Maintain in-house analytical expertise;
- Improve procurement procedures to free up specialist time for analysis – this could include training non-specialists in evidence commissioning processes and project management;
- Maintain and nurture external networks of knowledge and expertise, since we will not be able to get all the expertise we need in-house.

It is important to bear in mind that such approaches carry some risks, e.g.

- Damage to future provision of new knowledge – loss of expertise or facilities that are hard to rebuild if investment in primary research is curtailed;
- Other funders may also reduce their investment if they see us reducing ours;
- Experts may not be in a position to provide additional low-cost advice in a more resource constrained environment.

Stages of the Evidence Cycle

1. Identify and prioritise evidence needs: this incorporates both the immediately available evidence to support imminent policy development and, as importantly, longer term evidence needs to ensure that as policies emerge there is an appropriate evidence base on which to call.

Good practice includes the need to:

- Identify opportunities to work in partnership with other internal and external stakeholders;
- Identify key issues for the long term (horizon scanning of social, technological, environmental, economic and political trends);
- Review existing evidence (through systematic review of the literature and unpublished in-house information and/or consulting expert networks, Advisory bodies and stakeholders);
- Assess current policy direction against latest evidence;
- Develop a structured risk assessment to prioritise evidence issues;
- Identify the expertise required and build up the in-house team and external networks, ensuring availability for immediate and long-term needs;
- Identify opportunities for innovative approaches through forward-looking evidence assessments and R&D investment;
- Ensure a clear line of sight between long- and short-term evidence objectives and policy priorities;
- Set out a clear Evidence Plan, including rationale and objectives, together with how you plan to appraise, monitor and evaluate the programme (i.e. similar to a ROAME).

Horizon Scanning and Futures Research

Horizon scanning and futures research are intended to improve the robustness and resilience of Defra's policies, strategies and evidence base.

Horizon scanning involves the systematic examination of potential threats, opportunities and likely future developments which are at the margins of current thinking and planning.

Futures research can explore novel and unexpected issues, as well as persistent problems or trends. It involves applying a structured approach to enable the development of foresight into what future 'worlds' might be possible and/or plausible in a policy context. Thinking in future 'worlds' enables current assumptions to be challenged and risks to be analysed and stimulates opportunities and innovation.

Waste Evidence Strategy

When developing the Waste and Resources Evidence Strategy 2007–2011⁵⁵ the team engaged directly with policy, research and other stakeholders to:

- Jointly scope the policy and evidence questions (the Strategy was developed in conjunction with the Waste Strategy for England 2007);
- Analyse what types of evidence were needed;
- Assemble existing research and evidence to understand evidence needs.

The Strategy links the evidence requirements to the policy drivers, demonstrating a good line of sight between evidence and policy. It also considers and balances short-, medium- and long-term evidence needs thereby ensuring that Defra has the evidence required for both current policy formation and longer term strategic needs. The programme takes a multi- and inter-disciplinary approach and includes social and natural sciences, economic analysis and modelling, statistical data and interpretation, and stakeholder and expert opinions. Innovation also plays a key role in allowing the exploitation of new ideas. The Strategy has provided a useful tool to enable key stakeholders to have a clear view of Defra's evidence requirements in the waste and resources area and has facilitated joint working. It also contains a clear action plan which highlights the issues, actions needed and their timeframes, and whose responsibility it is to take them forward.

⁵⁵ See <http://www.defra.gov.uk/environment/waste/residual/wrep/documents/wres-2007-2011.pdf>

2. Gather evidence required: where this needs to be commissioned from external sources, the Defra Science Handbook sets out the processes to be followed (note that Defra will be reviewing the Handbook shortly with a view to streamlining the processes and extending their application to include all forms of externally commissioned evidence).

Good practice includes the need to:

- Select the most cost-effective and innovative approaches to providing robust new evidence to meet the stated objectives (in the Evidence Plan);
- Understand and apply the Defra Science Handbook and follow the appropriate processes to commission evidence;
- Ensure fit for purpose evidence by following evidence assurance processes, including internal and external peer review of proposals and research outputs;
- Actively project manage any commissioned work throughout the lifetime of the project including regular contact with the research team and, where appropriate, creating a steering or Advisory group;
- Ensure teams commissioning evidence have access to a range of necessary skills including knowledge of procurement rules and their application;
- Ensure better sharing and handling of knowledge and information so results are communicated efficiently. A new Defra Knowledge and Information Management (KIM) strategy is in preparation to put in place the appropriate processes to protect our assets while at the same time encourage greater collaboration and knowledge sharing. We will work with the KIM team to ensure this new strategy and the work on the EIS complement and augment each other.

The Science Handbook and the SIS Database

Defra's evidence specialists deal with a variety of procurement and record information management issues when managing the evidence commissioned from external organisations.

Procurement and contract law is highly complex and constantly evolving, so Defra evidence specialists are advised and assisted by the Department's procurement and legal experts. Standard procedures for procuring R&D contracts are contained in the Defra Science Handbook. This includes templates for approval to tender a contract, for applicants to use when submitting their proposals, and for reporting on progress once the contract is underway. Variants based on the templates have been designed for use by economists and social researchers.

The SIS database is the repository for information about all Defra's R&D contracts, including descriptions, budgets and outputs. The SIS provides information on our evidence contracts to Defra's website to ensure transparency and consistency and to support effective project and budget management. Good practice is that *all* evidence-gathering projects, including research and monitoring, should be entered on SIS. However, it currently has incomplete coverage of Defra's non-R&D and non-natural science evidence gathering, and is hampered by a complex interrogation function. We are currently reviewing how best to make our evidence database more user-friendly and to ensure that it captures all forms of externally commissioned evidence gathering.

In section 2.5 of the Strategy we make proposals to review the existing guidance with the aim of reducing the contract management burdens on evidence specialists.

3. Analyse and interpret evidence: A key role for internal evidence specialists is to provide analysis and interpretation of evidence and innovative options. They also translate specialist technicalities for policy and other specialist colleagues⁵⁶ in a usable and accessible format. In this, in-house specialists may be supported by external Advisory bodies or specialist consultants, often drawn from among our research contractors. Both in-house and external specialists will need a clear understanding of the policy requirements as well as the evidence base.

Good practice includes the need to:

- Develop the policy and communications/networking skills of the in-house specialist teams to enable effective linkage of policy-makers and sources of knowledge – and correspondingly devise ways to promote dialogue between external experts and the policy teams;
- Determine the time available for evidence gathering and level of expertise of the policy audience in order to provide summary documents or policy briefs in the most appropriate format (e.g. one page summaries);
- Effectively translate research including an assessment of uncertainty and risks around the evidence;
- Work with contractors and Advisers to ensure policy briefings are an accurate reflection of key messages and encapsulate the most important evidence;
- Disseminate and communicate evidence beyond Defra to ensure wide use of the investment and broaden the knowledge base – including clear accessible messages for the wider public.

⁵⁶ ERFF Report 03: Using research to inform policy: the role of interpretation. See <http://www.erff.org.uk/documents/2007-03-interpret-study.pdf>

4. Set up an evaluation process: As the implementation route becomes clear, ensure that evidence gathering is put in hand to help evaluate its impact and effectiveness. Ensure this is proportionate – sensitive to the scale of investment, and the criticality and timescale of the evidence required. This requires careful thought about when benefits might emerge after policy implementation and what might constitute leading proxy indicators of likely success or failure.

Good practice includes the need to:

- At an early stage, develop and make public a method to measure the economic, social and environmental impacts of evidence and the identification of effective indicators and milestones against which to monitor them;
- Base evaluation systems on evidence provided and measure the direct and indirect benefits of the evidence to the policy objective(s), including impact on policy effectiveness, cost-effectiveness and innovative solutions;
- Regularly re-assess evaluation systems and open them to external challenge to ensure the system is optimal and effective.

5. Assess the impact of evidence on policy development: It is important to show the value added to policy development stemming from the underpinning evidence base, as well as demonstrating the impact of a policy on its intended 'audience'.

Good practice includes the need to:

- Assess whether working in partnership added (or could have added) value to the outcomes of the research;
- Ensure policy development reflects the value of the evidence;
- Maintain good record and knowledge management, keeping an audit trail to enable the course of the evidence to be traced;
- Assess new evidence emerging after policy formulation for its support or challenge to the current policy;
- Build new evidence and data collected following implementation of the policy into the evidence base;
- Assess the quality and impact of evidence on policy through outcome focused evidence programme reviews;
- Recognise that evidence does not always imply a single interpretation or policy response (ambiguity).

Annex 2: Analysis of data for the Evidence Investment Strategy

Data collection

To understand and explore Defra's evidence issues of today and the future, information was collected from those programmes across the Department which have a significant evidence need. This included:

- 29 questionnaires completed by evidence managers and SROs;
- 30 challenge sessions where the CSA discussed the evidence-related activities and project lists of each programme (note the Environmental Regulation programme had a challenge session but did not complete a questionnaire and was excluded from the analysis as it was not found to have any evidence investment);
- Financial and staff information collected separately from evidence and finance managers from 30 programmes.

Data were only collected on the evidence activities of these core Defra programmes and excluded analysis of evidence work carried out by Defra's delivery network, NDPBs and the DAs. Therefore the data presented in this document should not be considered to reflect all of Defra's investment in evidence. The figures reflect only core Defra spend, and do not include funding contributions from elsewhere. For example, the Marine programme receives an additional £1.5m for monitoring costs from the European Commission which is not included in the figures.

Data analysis

All data from the questionnaires was collated into a database and reviewed for accuracy and validated against other sources of information (e.g. R&D budget information recorded on SIS, Strategic HR's information on staff in post and previous answers given for Parliamentary questions). When anomalies were discovered, further clarification with business areas was carried out.

Programmes were grouped into theme areas (AHW [note this is a part of FFG, but has been presented separately to aid interpretation], FFG, ERG and SEG). Budgets have been presented to appropriate levels of accuracy (either to the nearest £k or £m).

Financial information for 'other evidence' was calculated by subtracting the 'total budget for R&D' away from the 'total evidence' figures which had been provided by each programme. In some instances, for example when programmes had provided a combination of budget and spend, this resulted in calculated 'other evidence' as having a negative value. In these cases 'other evidence' figures were re-set to zero.

Staff costs (note this is not the same as staff pay as it includes the cost associated with facilities, support services, training etc) were calculated by multiplying the FTEs for each grade by the following average figures to give a reasonably accurate approximation :

Table A1: Staff cost

Grade	Staff cost per FTE (in £)
Senior Staff (SCS)	100,000
Grade 6 and 7	75,675
SEO/SSO and HEO/HSO	45,544
SO/EO	34,863
AO and AA	26,038

Assumptions and limitations

As with all data analysis, the conclusions which can be inferred are only as accurate as the raw data. In combining the information from the different programmes in order to make the outputs presented in this document the reader should be aware of the following limitations when considering the tables and figures which relate to the analysis. In particular:

Table 1: Defra's evidence budget breakdown for 2009/10 across Defra policy areas:

- Data has been presented rounded to the nearest £m. Therefore summing the rounded figures in each row or column may not necessarily add up to the total row or column value;
- Evidence budget information was provided and checked by business areas. However, these budgets may change over time. Thus care should be taken when interpreting the data on R&D and other evidence;
- FTE data were collected from programmes in September 2009 and it is expected that these figures will change over time. Together with the assumptions outlined with Table A1, this means the estimates of staff costs in Table 1 are approximations only.

Figure 3: Distribution of evidence budget for 2009/10 between programmes:

- As stated above, budget information may change over time, so care should be taken when interpreting these figures;
- 'Other evidence' budget was calculated for each programme as described above;

- FTE data were collected from programmes in September 2009 and it is expected that these figures will change over time. Together with the assumptions outlined in Table A1, this means the estimates of staff costs in Figure 3 are approximations only.

Figure 4: Links between Defra Programmes and DSOs:

- All 29 programmes provided a response as to how strongly they considered their programme to be involved in the delivery of each of the nine DSOs (i.e. primary, secondary, indirectly or N/A);
- The number of programmes for each category of response was calculated and used to generate the figures for each DSO;
- These data were not validated against any other information which may be held within Defra.

Figure 5: The distribution of the 239 Full Time Equivalent (FTEs) currently working on evidence according to specialism:

- In September 2009, 29 programmes provided information on the number of staff they had which worked on evidence broken down by specialism;
- Care should be taken when comparing these data against information on the numbers of staff associated with career homes as many specialist staff do not spend 100% of their time working on evidence and those that do may not necessarily be a member of one of the analytical career homes. However, preliminary analysis suggests these figures are sensible, although the FTEs for veterinary science were lower than expected.

Glossary

AHW	Animal Health and Welfare
BAU	Business As Usual
BBSRC	Biotechnology and Biological Sciences Research Council
BiodivERsA	Biodiversity ERA-NET
CAP	Common Agricultural Policy
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CSA	Chief Scientific Adviser
DA	Devolved Administration
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DSO	Departmental Strategic Objectives
EA	Environment Agency
EIS	Evidence Investment Strategy
EMIDA	Emerging and Major Disease In Animals
EOF	Environmental Observation Framework
ERA-Nets	European Research Area Network
ERFF	Environment Research Funders Forum
ERG	Environment and Rural Group
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
ESRCH	Economics, Statistics and Research Career Home
EU	European Union
Fera	Food and Environment Research Agency
FFG	Food and Farming Group
FMD	Foot and Mouth Disease
FP7	7th EU Framework Programme
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IA	Impact Assessment
IPCC	Intergovernmental Panel on Climate Change
KIM	Knowledge and Information Management
KM	Knowledge Management
LCEGS	Low Carbon and Environmental Goods Service

LWEC	Living with Environmental Change
MMO	Marine Management Organisation
MCZ	Marine Conservation Zone
MRC	Medical Research Council
NBU	National Bee Unit
NDPB	Non-Departmental Public Body
NE	Natural England
NERC	Natural Environment Research Council
NISP	National Industrial Symbiosis Programme
OECD	Organisation for Economic Co-operation and Development
PSA	Public Service Agreement
R&D	Research and Development
RDPE	Rural Development Programme for England
RADAR	Rapid Analysis and Detection of Animal-related Risks
ROAME	Rationale, Objectives, Appraisal, Monitoring and Evaluation
SAC	Science Advisory Council
SCAR	Standing Committee on Agricultural Research
SCP	Sustainable Consumption and Production
SCS	Senior Civil Servant
SDRN	Sustainable Development Research Network
SECH	Science and Engineering Career Home
SEG	Strategy and Evidence Group
SG	Scottish Government
SIS	Science Information System
SPRU	Science Policy Research Unit
SRO	Senior Responsible Owner
TEEB	The Economics of Ecosystems and Biodiversity
TSB	Technology Strategy Board
TSE	Transmissible Spongiform Encephalopathy
UKCP	UK Climate Projections
VetCH	Veterinary Career Home
VfM	Value for Money
VLA	Veterinary Laboratories Agency
WRAP	Waste and Resource Action Programme

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