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Science for Defra: excellence in the application of evidence

29 – 30 March 2017

Conference report
Defra and the Royal Society



1. Introduction

On 29 and 30 March 2017 nearly 300 academic scientists, government scientists and policymakers attended a conference jointly organised by Defra and the Royal Society, hosted at the Royal Society in London.

The conference aims were to:

- Showcase the best in both academic and government science related to Defra's areas of research interest.
- Identify current evidence gaps and research priorities for Defra and the academic community.
- Enrich the dialogue between academic and policy communities, and between academic and government scientists.

The Royal Society has a long standing commitment to providing accessible, authoritative and timely scientific evidence and advice for policymaking. The conference was something of an experiment and trialled new ways for the Society, and the scientific communities it represents, to work more closely with government departments and associated agencies. As Professor Ian Boyd, Defra's Chief Scientific Adviser, described in his introduction, the ideas discussed and connections made at the conference will help Defra cement stronger working relationships with the research community, across all its areas of interest. The conference offered an opportunity for scientists employed by Defra to interact on strategic issues with Fellows of the Royal Society, to continue to build the strong community of scientists in Defra and to open up Defra science to early-career researchers and academic and research council communities.

The first step towards achieving an improved understanding of Defra's research agenda within the research community has been the publication of Defra's Areas of Research Interest¹. This follows a call by Sir Paul Nurse in his 2015 review of the research councils²: "There is a need across the full range of government departments for a more strategic approach in relation to their departmental R&D programmes. This is partly a matter of securing the right levels of resource, but includes maintaining 'statements of need', in terms of the most important research questions confronting the departments. These will require work across the Government analytical professions to develop." Defra's areas of research interest are in the form of a series of high level questions and clearly set out Defra's long term evidence challenges.

The sessions at the conference covered many of these interests including food and farming, environmental quality, the natural environment, animal and plant health, and the coastal and marine environment – but it was acknowledged that it would not be possible to cover all of Defra's research interests in detail within two days.

1. Defra group areas of research interest <https://www.gov.uk/government/publications/defra-group-areas-of-research-interest>

2. Nurse review of research councils <https://www.gov.uk/government/collections/nurse-review-of-research-councils>

This summary report captures highlights from the two days. It includes a summary of identified evidence and policy challenges, summaries of all of the main sessions, and possible next steps, as well as pulling out emerging themes and their implications, including:

- Making the best decisions in the face of uncertainty
- The role of values and beliefs
- Interdisciplinary working and a systems approach
- Evidence synthesis
- The relationship between the natural environment and human health and wellbeing
- Land use
- Big data and optimising the use of existing data
- The global perspective.

This report presents the discussion points covered at the conference and does not represent either Defra or Royal Society policy positions.

2. Summary of evidence and policy challenges

During the first morning of the conference some of Defra's departmental and agency science leads outlined their biggest science policy challenges and leading scientists and other experts presented the latest science and gave their perspective on these challenges. There was a high degree of congruence between these two groups. The following section summarises this discussion.

General challenges

It is important that the scientific and research skills in the civil service are nurtured and developed in ways which fit with the needs of government. These skills can be very different from those developed within the wider research community. Sir Mark Walport FRS presented a description of government science and engineering, and how the 'Government Science and Engineering Profession'³ is being developed to cater for these specific needs (see Section 3).

Defra has about 30 independent science advisory committees and many other ad hoc groups of advisers who support the department by providing expert opinion and analysis on specific subjects. Combining these sources of expert opinion leads to a richness of information. Defra's sources of expertise are multi-disciplinary including the social and natural sciences, economics, engineering and the humanities. Time demands on policymakers, however, can sometimes limit how much they can engage with a diverse academic community when making decisions. Working with those individuals who are appointed advisers and intermediaries gives access to their networks but there is a need to make this work more effectively.

There may be a broader range of mechanisms for building closer links between Defra and the non-government research community, including widening the circle of subject experts in key areas and creating mechanisms to integrate external researchers into Defra so that they can get direct experience of the policy environment. Drawing on the advice of academic experts who are not formally part of the political system to fulfil the role of 'critical friend' will remain important.

Natural environment

Policy challenges related to the natural environment included how biodiversity will be affected by climate change and the persistent challenge of freshwater diffuse pollution, and how changes in the natural environment and ecosystem services affect human health and wellbeing. The relationship between the natural environment and human health was a recurring theme, and seems an important area for policy development as well as a topic for further research. The relationship between agriculture and the natural environment was also a recurrent theme, with several suggestions that the 25 year plan for the environment should work in tandem with the new agricultural policy framework post-EU Exit.

3. Government Science and Engineering <https://www.gov.uk/government/organisations/civil-service-government-science-engineering>

Food and farming

EU Exit has the potential to provide opportunities to reform UK agricultural policy on a scale which has not existed for over forty years. In February 2017 Defra set out ‘five pillars’ which will likely frame future agricultural policy for the UK. These are: global demand and trade, productivity and competitiveness, resilience, sustainability and the environment, and food safety and consumer trust (including promotion of animal and plant health and welfare)⁴.

The big policy challenge is to clearly articulate what ‘better’ looks like and come up with a feasible and deliverable new model to replace the Common Agricultural Policy. There are also challenges in managing a smooth transition between the two policies so that farmers and landowners can manage risk and uncertainty. More specific research challenges included:

- Knowledge exchange with farmers
- Further developing tools to manage pests and improve farming effectiveness
- Big data – including Defra more fully understanding and utilising the potential of existing data to support or address its policy challenges
- Sustainable intensification – to support the global food supply chain
- Tackling global challenges around the complexity of the food supply chain
- Implementing effective real time policy evaluation.

Additional emerging challenges included those associated with infectious disease due to climate change, the relationship between human health, agriculture and the countryside more broadly and the importance of tracking and minimising waste while increasing productivity.

New technologies will be an increasingly important feature of food and farming, including robotics, artificial intelligence and genomics. For example, the potential role of genetic technology to develop the perennialisation of arable crops, and removing the need for fossil fuels to produce nitrogen fertilizer by adapting crop plants to have their own nitrogen fixation properties. However, there is also a need to be realistic about the potential time scales needed for developing these new technologies, given that recent field trials to develop these potentially beneficial qualities have failed.

Environmental quality

Environmental quality policy challenges included air quality, water quality (particularly how new techniques in genetic technology may assist in monitoring and measuring water quality), and reducing waste and pollution (including mitigating the potential environmental impacts of microplastics), the impact of antimicrobial resistance on ecosystems, and maintaining high environmental standards post-EU exit.

There may be a compelling case for using new methods to guide policy and regulation on nitrogen pollution in waterways. Currently policy uses phytoplankton as an indicator of nitrogen pollution. Since this policy was developed, there is now a better understanding of interactions within the system and a wider range of indicators could be used.

4. Environment Secretary speaks at NFU conference <https://www.gov.uk/government/speeches/environment-secretary-speaks-at-nfu-conference>

3. Session summaries

Reflections on using evidence and engagement with Government

Speakers: Dr Gemma Harper (Defra) and Professor Charles Godfray CBE FRS (University of Oxford).

Gemma Harper and Charles Godfray reflected on their experiences of working for/with Defra, and using evidence within the department. Both emphasised the difference in culture between research institutes and government.

Gemma stated that she only really understood policymaking once she had walked in policymakers' shoes: "you can get hauled in front of a select committee at any point and have to be able to clearly recite and defend your evidence". She emphasised that as a result, there is a huge culture of evidence in government and really understanding ministers and their needs is the heart of good policymaking.

Charles Godfray described the role of Defra's Science Advisory Council, which he currently chairs. The Science Advisory Council is made up of both natural and social scientists and responds to scientific issues raised by the Chief Scientific Adviser, ministers and officials. It also provides a long-term horizon scanning role, hosts high level discussions and examines in fine detail the evidence on specific topics.

Panel discussion: Anticipating the role of research in future food and farming policy

Chair: Professor Charles Godfray CBE FRS (University of Oxford)

Panel: Professor David Baulcombe FRS FMedSci (University of Cambridge); Mrs Sarah Church (Defra); Professor Sarah Whatmore FBA FAcSS (University of Oxford); Professor Michael Winter OBE (University of Exeter);

Defra representatives began by describing both the challenges and opportunities in designing an alternative to the Common Agricultural Policy post-EU exit. This will involve uniting Defra's strategic plans for food and farming and for the natural environment. The process will require experts from both natural and social sciences. A core challenge is better knowledge exchange with farmers and rural communities. Survey data can give us a lot of information about who owns land, in terms of demographics, and this information could be used to inform better dialogue and knowledge exchange.

The importance of interdisciplinary working and obtaining a range of opinions, including public opinion, was also outlined. The learned societies may have a role to play in ensuring that combinations of perspectives and possible solutions are brought together. Lessons on public dialogue could also be learnt from other sectors, such as the mobile phone industry which has thrived on user feedback.

The role of output driven policy was also highlighted, noting that, in an ideal world it would be up to the public, farmers, land owners and scientists to articulate what it is that society wants for the future of the UK countryside before designing a workable policy framework to support this.

Panel discussion: Environmental quality

Chair: Professor David Fowler CBE, FRS, FRSE (Centre for Ecology and Hydrology, Edinburgh).

Panel members: Ms Harriet Wallace (Defra); Professor Paul Monks FRMetS FRSC (University of Leicester); Professor Stephen Holgate CBE FRCP FRCP FRCPATH FIBMS FSB FMedSci (University of Southampton); Professor Penny Johnes (University of Bristol).

David Fowler highlighted the history of environmental quality legislation in the UK, discussing past successes as well as persistent challenges. For example, the air pollution of the mid-20th century, including smogs and acid rain, are now in the past thanks to a twofold decrease in sulphur emissions since the 1960s (Figure 1). However, problems persist including nitrogen pollution from agriculture and a reduced life expectancy in our cities due to particulate pollution. David's take home messages included: the important role of single, newsworthy events as policy drivers; the notable role of science in informing legislation (both in the past and going forwards); the need for evidence synthesis to identify solutions to current challenges; and the need for continued monitoring and joined-up systems thinking for policy and action to be effective.

Panellists highlighted the variety of contributors to particulate pollution beyond transport, including home heating (the burning of wood fuel), agriculture and construction. They also discussed the potential trade-off between tackling climate change and protecting human health. Wood burners for home heating could be preferable given these use a renewable energy source, however these are the biggest contributor to particulate pollution in many areas. Diesel cars also emit less carbon dioxide but more nitrogen dioxide which is linked to respiratory problems.

It was suggested that in order to move the public debate forward, strong ownership by the medical profession of the health case for action, and clear communication on health risks and solutions, would be valuable.

Nitrogen pollution in waterways was also discussed, noting that it is almost entirely from agriculture, particularly livestock.

FIGURE 1

David Fowler shows air quality in London has improved drastically with SO₂ levels having halved in 15 years and halved again since. (Graph shows sulphur dioxide measured using two methods – UV in blue and the more recent bubbler method in red).



Panel discussion: Resilience and climate change breakfast

Chair: Professor Pete Smith FRS FRSB FRSE (University of Aberdeen).

Panel members: Professor Nigel Adger (University of Exeter); Dr Molly Anderson (Defra); Dr Chris Hope (University of Cambridge); Alyssa Gilbert (Imperial College London); Professor Chris Thomas FRS (University of York).

This breakfast discussion began by highlighting the essential role of land use in climate change adaptation and mitigation. Agriculture, forestry and soil are all important for carbon sequestration. Defra is responsible for coordinating government efforts to assess and monitor climate risks. It monitors and addresses the biggest climate risks for the environment and natural capital, including flooding, drought, and the impacts for marine, freshwater and terrestrial ecosystems. It also plays a specific role in tackling emissions from agriculture, land use and waste, and considers the adaptation and mitigation benefits from improving air quality.

Panellists highlighted the multiple benefits of good environmental management, including for soils, environment, wildlife and carbon capture. However, there are still challenges in quantifying the impact of land management and use decisions.

Another theme of the discussion was the long timescale over which climate change impacts occur, meaning it is difficult for people to imagine or plan for future impacts. Panellists felt that the five year policy cycle was too short and that future-proofing policies beyond this timescale was required. Climate models usually project over a 200 year period and only 2% of projected climate impacts will be seen by 2045. There is also the need to consider trade-offs and interlinkages (for example heat and pollution in cities) when formulating management plans.

Opportunities highlighted by the panel included the potential for a bold, long-term land management plan that considers future climate change impacts, allows for species movement and biodiversity changes, and enables the UK to remain a world leader in climate change modelling.

Panel discussion: Natural environment

Chair: Professor Dame Georgina Mace DBE FRS (University College London).

Panel: Professor Ian Bateman OBE FRSA FRSB (University of Exeter); Dr Rob Bradburne (Defra); Dr Claire Feniuk (RSPB); Professor Maggie Gill (University of Aberdeen); Professor Chris Thomas FRS (University of York).

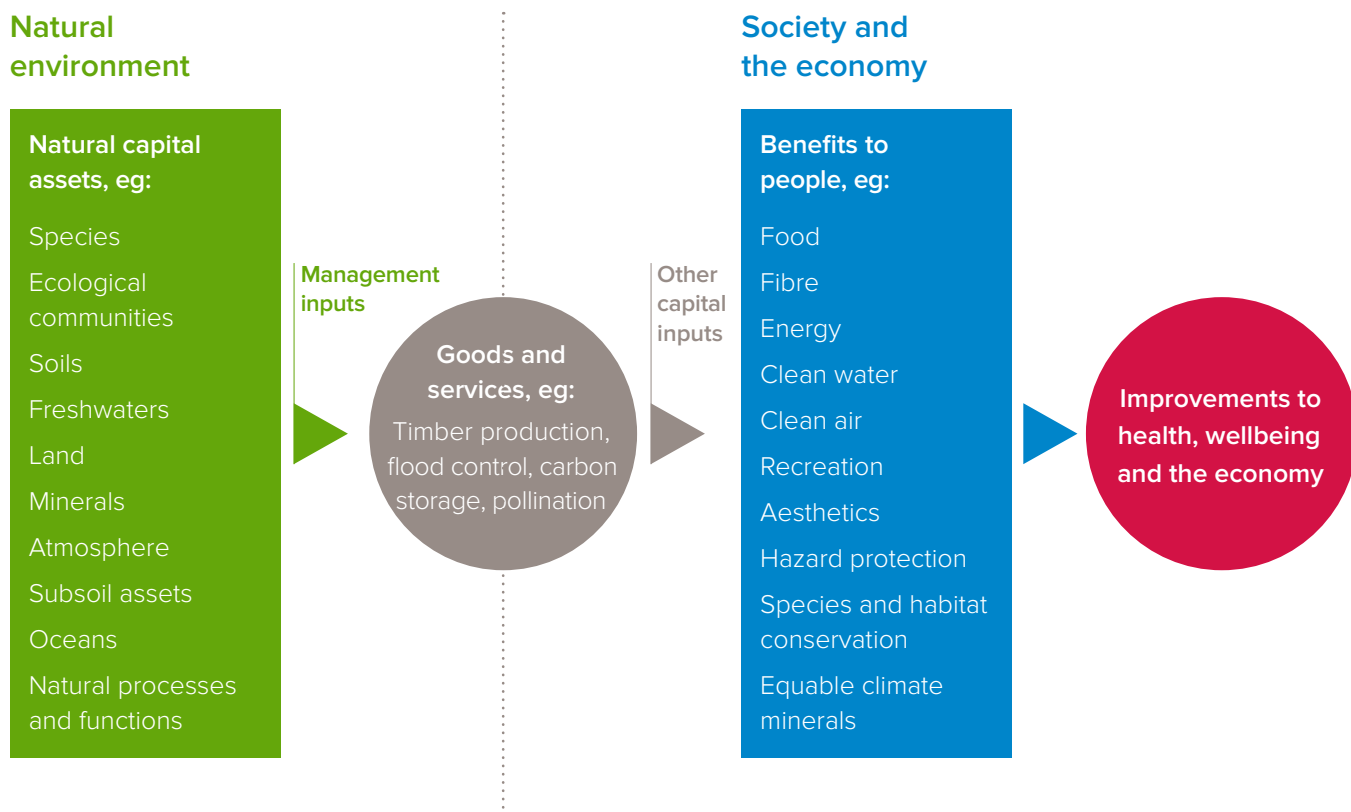
Georgina Mace began by defining what the natural environment is: the interacting set of components and processes that are not man made and therefore arise naturally. She highlighted that we need and depend on the land in a range of ways, which underpin health and wellbeing and the economy (Figure 2). Identifying society’s needs and demands from the natural environment, from food to mental health benefits, is an important first step and this should be the focus of future land use decisions.

The panel discussion highlighted the challenges for planning land use when species and the landscape are constantly changing. Panellists asked if the UK could be a big contributor to global biodiversity, adding that bold plans to manage the land in a way which values biodiversity would be needed to achieve this. There are already a lot of existing data and research which inform the Scottish land use policy, but there are challenges in obtaining agreement from multiple stakeholders and the UK as a whole on what optimal land use should be.

It is now possible to reliably put a monetary value on many natural things, but communicating these to the Treasury can be challenging, and it must be recognised that some benefits, such as biodiversity, cannot be easily valued. Land use that reliably provides a good return on investment, includes woodland planting, upland peatland restoration and wetland creation. A key theme brought up by the panel was the need for an integrated land use policy that plans for both the natural environment and for food production.

FIGURE 2

Nature at work: Natural capital assets and economic and societal benefits.



Re-launch of the science and engineering profession within Government

Speaker: Professor Sir Mark Walport FRS FMedSci, Government Chief Scientific Adviser, Government Office for Science.

In his address, Sir Mark Walport spoke about his work to re-launch the Science and Engineering Profession within Government. He outlined the key difference between being an adviser and a politician: it is the job of the politicians we elect to make the difficult decisions and address complex demands; it is the government scientists' and advisers' jobs to provide unbiased scientific expertise.

Politicians view evidence through three lenses: their own values and beliefs, the feasibility and deliverability of the proposal, and the values of their constituents and of the electorate as a whole. Mark described how policymakers often require succinct summaries of the entire body of evidence on a subject, which is unbiased and exhaustive. Scientists also need to be able to clearly articulate what they don't know and the limits of available evidence.

Mark Walport concluded by outlining how the Civil Service aims to be the most attractive and exciting place in the UK for science and technology graduates to work, and discussed the potential to expand the Science and Engineering Profession within Government initiative to a wider network outside government.

Science for food and farming policy: connecting for coherence

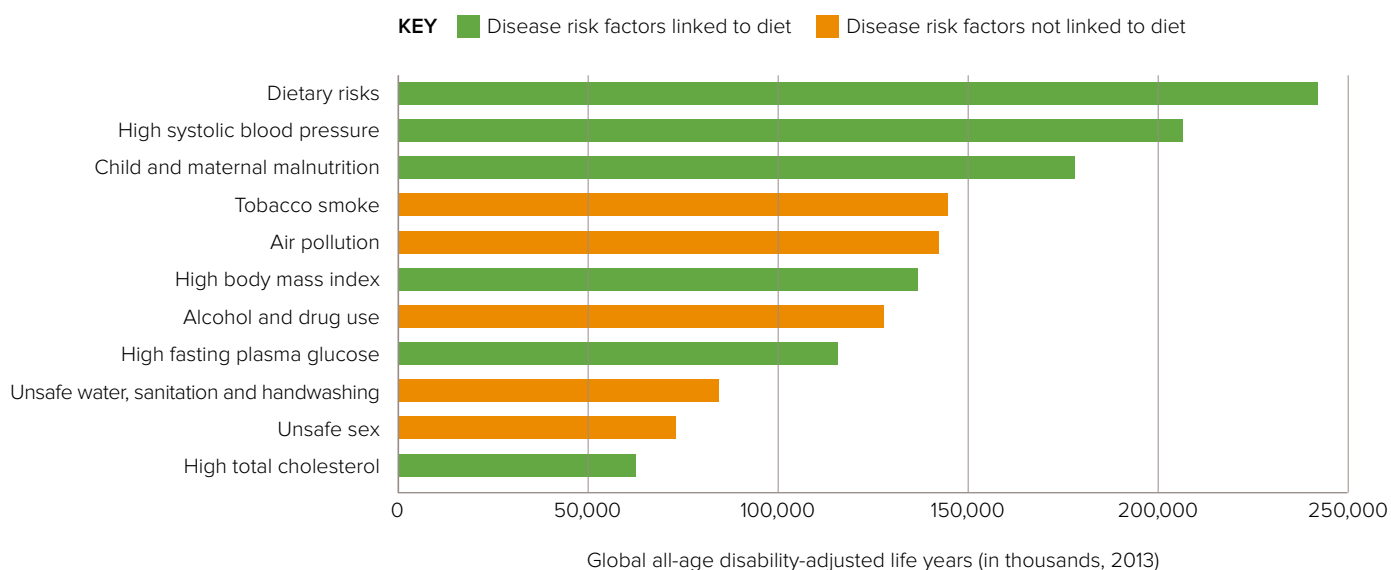
Speaker: Professor Corinna Hawkes (City University of London).

Corinna Hawkes described how traditional scientific advice which inputs into the development of agricultural policy had focused on farm productivity with little consideration of the science of what we eat (consumer behaviour). She suggested that the disconnect between agricultural, environmental and dietary sciences, as well as the economics of food production, has caused people in the UK and globally to consume food which is both bad for their health and bad for the environment. Diet risks are a major cause of disease globally (Figure 3) yet health and nutrition is not currently integrated into agricultural policymaking.

Corinna highlighted the need to consider the whole food system and not just the food production system when considering the evidence requirements of food policymaking. The goal should be to produce a coherent food policy that meets multiple agricultural and health goals. The Department of Health already produces dietary guidelines. This is a good starting point and these now need to be linked to the rest of the food system. A joined up, integrated food system policy can produce outcomes which are best for both people and the planet.

FIGURE 3

Six of the top 11 risk factors driving the global burden of disease are related to diet.



Panel discussion: Data and technology

Chair: Professor Sir Martin Sweeting OBE FRS FREng FIET (University of Surrey).

Panel: David Askew (Natural England); Dr Sue Black OBE (University College London); Professor Mark Maslin FRGS, FRSA (University College London).

The panel discussed how to best manage and exploit the potential of satellite technology and big data, with references to the Royal Society's report *Observing the Earth*⁵. They discussed the different applications of earth observations data, including monitoring crop health for food security, land use change, environmental impacts, water quality monitoring and ecological and agricultural condition monitoring; before discussing the potential to use earth observation data to ask new questions.

Satellite technology is now so good that Defra could ask "How many trees are there in a specific area of the UK?" and an answer could be given. One challenge raised was the skills and resource requirements of the relevant communities involved, particularly ecologists and farmers, to allow them to make use of available data. Another challenge was linking the datasets from academia with industry and policy needs. Overall it was felt that with the right level of skills and communication, technology and data had the potential to greatly increase our understanding of the natural world.

Defra science showcase sessions

The excellent *Defra science showcase sessions* celebrated the vast amounts of cutting edge science and technology the department sponsors, supports and works hard to develop – often with colleagues from other scientific institutions at home and abroad.

Examples included scientists from Natural England working with Woking Council to protect the great crested newt⁶; collaborative work between Kew Gardens and Queen Mary University London to sequence the genome of the British ash tree, to understand which genes may confer resistance to ash dieback disease⁷; and the Forestry Commission and University of Bangor who are developing methods to identify the causes of acute oak decline⁸.

5. Observing the Earth – expert views on environmental observation for the UK <https://royalsociety.org/topics-policy/projects/environmental-observation/>

6. Planning a brighter future for the great crested newt <https://naturalengland.blog.gov.uk/2016/05/25/planning-a-brighter-future-for-the-great-crested-newt/>

7. Ash tree genomes <http://www.ashgenome.org/>

8. Forest Research, acute oak decline <https://www.forestry.gov.uk/fr/INFD-7UL9NQ>

4. Emerging themes

Making the best decisions in the face of uncertainty

A key challenge identified was ‘acting in the face of uncertainty’ and this was a theme that recurred throughout the two days, across all topic areas. Uncertainty is endemic in policy and sometimes this is not always reducible by further research or new evidence. As Mark Walport described, it is not up to scientists to make decisions in the face of uncertainty, this is the job of politicians, using the precautionary principle where appropriate. The job of government scientists and policy advisers is to provide an accessible synthesis of all available evidence and to clearly articulate what is not known.

Interdisciplinary working and a systems approach

Clare Moriarty, Defra Permanent Secretary, stated in her closing remarks: “Systems thinking, interdisciplinary working, uncertainty...that’s our life!”. She described how better decisions can be made when evidence is combined and communities work together. Interdisciplinary working featured in a number of panel discussions, referring to obtaining evidence from different disciplines and obtaining a range of views from experts in a single discipline. There is a richness of information which can be obtained by combining data and opinions from multiple sources.

Corinna Hawkes expanded the idea of ‘interdisciplinarity’ and systems thinking to include government departments. She described the value of cross-departmental working on food policy, uniting agricultural, nutritional, health and environmental policy in an approach which considers the whole food system. Others noted the value of including the Department of Health within discussions on air quality and the future of the countryside. There are many other examples of policy topics where cross-departmental working would be beneficial.

The importance of an integrated systems approach was highlighted throughout the conference. Considering whole sectors and modelling complex community-based systems which cut across many academic fields is crucial for policy development in areas affected by climate change and other long-term challenges, such as air quality. A systems approach is also vital for anticipating and responding effectively to new and emerging threats.

The role of values and beliefs

‘Values and beliefs’ are the lenses through which all evidence is interpreted, and in recognising this we can make better use of evidence. As well as their own values and beliefs, politicians can interpret evidence in light of the values and beliefs of their constituents and the electorate as a whole. Clearly presenting high quality, synthesised evidence and an unbiased interpretation of all available data is important; values and beliefs also need to be openly acknowledged at an early stage by both politicians and the scientists and advisers guiding them. There will always be a challenge for scientific advisers in separating their own views from their analyses of the evidence, making unbiased systematic methodologies all the more important.

Evidence synthesis

Closely related to the points above, many policymakers and scientists at the conference recognised the value of evidence synthesis. What ministers, politicians and policymakers require is a summary of the totality of the evidence. It was agreed that evidence synthesis techniques that produce syntheses which combine evidence from multiple sources and disciplines, within a timescale useful to policymakers, and in an unbiased, systematic way, are certainly required for the key issues that Defra is facing.

Relationship between the natural environment and human health

Further understanding the relationship between the natural environment and human health was called for by both scientists and policymakers. Health has traditionally been a driver for action in addressing air quality, and the health impacts of particulate pollution is well evidenced. However there are areas where the relationship between the environment and health is less well understood, for example the mental and physical health benefits of the countryside and coasts.

Valuing the environment in terms of human health and wellbeing may provide an important opportunity to justify funding for a future agricultural policy by the Treasury, presenting the benefits in terms of savings to other government departments.

Land use

Land use was a theme which united discussions about food and farming and the natural environment throughout the conference. Georgina Mace structured the natural environment panel discussion around land use and others suggested that we would decry any food and farming policy which did not consider the natural environment, and so the same should be true for any natural environment policy which ignores food. The banner under which these can be united is a land use strategy.

Scotland already has a land use strategy informed by evidence from the Rural Economy and Land Use Programme⁹ and the *Foresight report on land use futures*¹⁰. Work on 'land sparing', 'land sharing' and designing landscapes which optimise both food production and environmental outcomes were presented. It was recommended that new agricultural policies to replace the Common Agricultural Policy would be the place to consider the future of farming and the 25 year plan for the environment under a 'land use' umbrella.

Big data and optimising the use of existing data; the importance of emerging technologies

Perhaps most obviously within the data and technology panel discussion, but also throughout the conference, there were references to the large amount of data already owned by Defra, and also new types of data and ways of analysing and interpreting existing data that could be useful to Defra and others in addressing its policy challenges and research priorities. Using new technology to make the best use of data already owned by Defra is an exciting area for collaborative development. A clear message from the conference was that the use of data and adoption of emerging technologies can lead to innovative ideas, practices and the streamlining of operational applications.

The global perspective

Defra acknowledged that during the next five years policy was likely to enter a slightly inward looking phase, focusing on the UK's own new agricultural and environmental policies. However, Defra also recognised the importance of continuing to look outward, with particular reference to the potential danger of exporting environmental impacts if, for example, we import more food from the rest of the world. In addition, many issues do not follow national boundaries, such as climate change or air quality. All agreed that a global perspective was important and Defra would be mindful of this in coming years.

9. <http://www.relu.ac.uk/>

10. <https://www.gov.uk/government/publications/land-use-futures-making-the-most-of-land-in-the-21st-century>

5. Conclusions and next steps

As Clare Moriarty stated, it is important that these conversations do not end here. Every time we do something, as a scientist or as a policymaker we should think “who could I share this with to make it better”. Clare outlined a vision for an ‘open’ Defra, where there are no barriers to getting all stakeholders in the room and talking through decisions in an informed way. Publication of Defra’s Areas of Research Interest and this two day conference have been important starting points. Both have been very well received by those inside and outside government as a means of stimulating conversation and collaboration according to Defra’s research needs.

The vision is for Defra to have access to the very best thinking from across all disciplines to inform its policymaking, and for this to set the precedent for other government departments. Defra will continue to explore ways to create a porous boundary between the department and the wider scientific community. Two immediate areas which Defra has identified to be taken forward include:

1. Environment and human health: to lead work demonstrating the links between the natural environment and human health; so that Defra can demonstrate the wider benefits to society of work on, for example, improving air quality.
2. A community approach to the integrated modelling of systems: examining the potential for and application of an approach to environmental systems modelling.

In addition, there will be challenges for agricultural and environmental policy over the coming years, which provide an ideal opportunity for Defra to work collaboratively with all stakeholders to lead the way in terms of evidence provision and synthesis, demonstrating excellence in the application of evidence to policy making.

The Royal Society

The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, as it has been since its foundation in 1660, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society's strategic priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society.

These priorities are:

- Promoting excellence in science
- Supporting international collaboration
- Demonstrating the importance of science to everyone

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Defra

The Department for Environment, Food and Rural Affairs (Defra) is the UK government department responsible for safeguarding our natural environment, supporting our world-leading food and farming industry, and sustaining a thriving rural economy. Defra's broad remit means it plays a major role in people's day-to-day life, from the food we eat, and the air we breathe, to the water we drink. Defra is a ministerial department, supported by 33 agencies and public bodies.



Founded in 1660, the Royal Society is the independent scientific academy of the UK, dedicated to promoting excellence in science

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