
The role of science in evidence-based policy making

Perspectives from climate policy

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Changing Arctic Ocean Programme Meeting – 28/29 September 2017

 Department for
Business, Energy
& Industrial Strategy

Talk Outline

1. Introduction to the BEIS science team in SICE
2. Why does climate policy need science?
 - The importance of the IPCC
 - Examples of successful science to policy
3. What do decision makers want?
 - Tips for translating climate science into policy
 - How to work with BEIS
4. How can the NERC CAO programme fill future evidence gaps?
 - Climate science evidence gaps endorsed by CSA
 - Marine science research priorities (GO Science)

BEIS Science Team

Support national climate science capability and commission evidence

Provide strategic and responsive scientific advice to BEIS

Act as UK focal point for IPCC and international science diplomacy

Manage the compilation of the official UK Greenhouse Gas Inventory



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Firstly, we work in the interface between science and policy. We are not policy makers, we interpret the science and provide impartial advice for policy teams in BEIS.

These four areas broadly illustrate our key purpose, but each of these cover a wide range of activities and it's difficult to capture everything.

BEIS Science Team

Support national climate science capability and commission evidence



- Support Earth Observation Programmes and Met Office Hadley Centre Climate Programme
- Commission evidence, e.g. 1.5 °C and AVOID
- Build links with research community
- Provide some direction to research councils

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Our team ensures that the UK has a climate science capability and supports various earth observation programmes. We fund the Met Office Hadley Centre alongside Defra, which enables underpinning research around climate variability and change that supports a great deal of academic research in this area. Additionally, the MOHCCP has a climate services component, where policy relevant research is carried out to meet specific needs. BEIS currently commissions climate services around air quality and carbon budgets.

We commission work directly – firstly because we can be very specific about what we need and secondly because it allows us to deliver evidence quickly to feed into policy cycles which operate on short timescales. Examples include the 1.5 °C research programme, which is currently gathering evidence in time for the IPCC special report on 1.5 °C that will be published in Sept 2018. This report will advise national and international policy around meeting the 1.5 °C temperature target of the Paris Agreement. Also recently commissioned the AVOID programme to develop the evidence base around the impacts of climate change at different levels of warming.

A key part of our work is building links with the research community. We have recently introduced an expert seminar series in our climate science team, where we welcome external scientists to present the latest research from their area of expertise.

We also provide some direction to the research councils on their work programmes. In the UK at the moment, there's a big push to encourage the councils to fund policy-relevant research so this link to government is important to them. E.g. the NERC Greenhouse Gas Removal programme to improve our knowledge of the options for removing carbon dioxide and other greenhouse gases from the atmosphere. This will help us to understand the potential role of future technologies in mitigation, taking into account environmental, technical, economic and wider societal issues.

BEIS Science Team

Provide strategic and responsive scientific advice to BEIS



- Briefings for policy and ministerial teams
- Advise on UK and EU positions in UNFCCC negotiations
- Parliamentary questions
- Response to science media coverage

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We provide advice or information directly to policy teams through briefings for example on a wide range of issues, such as global and UK climate change and the urgent need for action, adaptation and mitigation, bioenergy, land use, shale gas, greenhouse gas removal technologies, etc which they then consider alongside other political or economic priorities before forming UK policies.

In recent weeks we have prepared briefings for ministers, both for information (e.g. State of the Climate in 2016 report) and to request a decision (e.g. around UK funding for the IPCC)

We check and advise on UK positions going into the UNFCCC negotiations to make sure they're scientifically robust. This also involves negotiating for the EU on scientific issues under the UNFCCC, and occasionally the Convention on Biological Diversity.

We also provide responsive advice, for example following media headlines around climate issues. You will probably have seen the widespread media coverage last week claiming that climate change is not as bad as we thought following a paper published in Nature Geoscience with a revised estimate of our global carbon budget. The paper suggested that the 1.5 °C temperature target of the Paris Agreement may be achievable, but was misleadingly reported by many newspapers and we were involved in some immediate work to provide our ministers, comms teams and other government departments with a briefing to ensure that the scientific evidence was conveyed correctly to them. I'll go on to talk about this kind of work a bit later on, and how much we value assistance from the scientific community in responding rapidly to this kind of issue.

BEIS Science Team

Act as UK focal point for IPCC and international science diplomacy



- Lead UK engagement with IPCC
- Ensure IPCC products are useful, high quality and policy-relevant
- Nominate experts; review reports; attend approval sessions
- Work closely with other countries

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SICE leads UK engagement with the IPCC, our main aim being to ensure IPCC products are useful, policy relevant (but policy-neutral) and of high quality. We also facilitate participation of UK experts in the production of IPCC's reports, help manage the IPCC budget and engage constructively on procedural matters.

Our team is responsible for delivering the UK's input to the IPCC as a member of its panel. We review the reports, nominate experts and attend the approval sessions to ensure that the summaries for policy makers are an accurate reflection of the underlying science and are relevant to policy makers.

The scope of the AR6 was agreed at the IPCC Plenary in September 2017, with participation from SICE.

We also work closely with other countries, such as China and India, in communications around climate science evidence, and in certain projects – e.g. investigating at what point we will hit a threshold for a particular impact of climate change.

BEIS Science Team

Manage the compilation of the official UK Greenhouse Gas Inventory



- Compile and report data on UK greenhouse gas emissions
- Requirement of 2008 Climate Change Act

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Our team is responsible for compiling and reporting the data on UK greenhouse gas emissions. This is a requirement of the 2008 Climate Change Act, where the UK committed to reducing emissions by at least 80% compared to 1990 levels by 2050. Each year we produce a report that is available on the .gov website showing how emissions from each sector (i.e. transport, agriculture, energy etc) have changed compared to the previous year and to 1990. These values have also proved important in demonstrating how stringent policies to reduce emissions are compatible with growth – for example in 2016 emissions were reduced by 42% compared to 1990 whilst GDP had risen by 67%.

Why does policy need science?

'Science without policy is the pursuit of knowledge. But policy without science is the ambition of ignorance'

Grant Allen (Illingworth & Allen, 2016)



By Peter Amsharov

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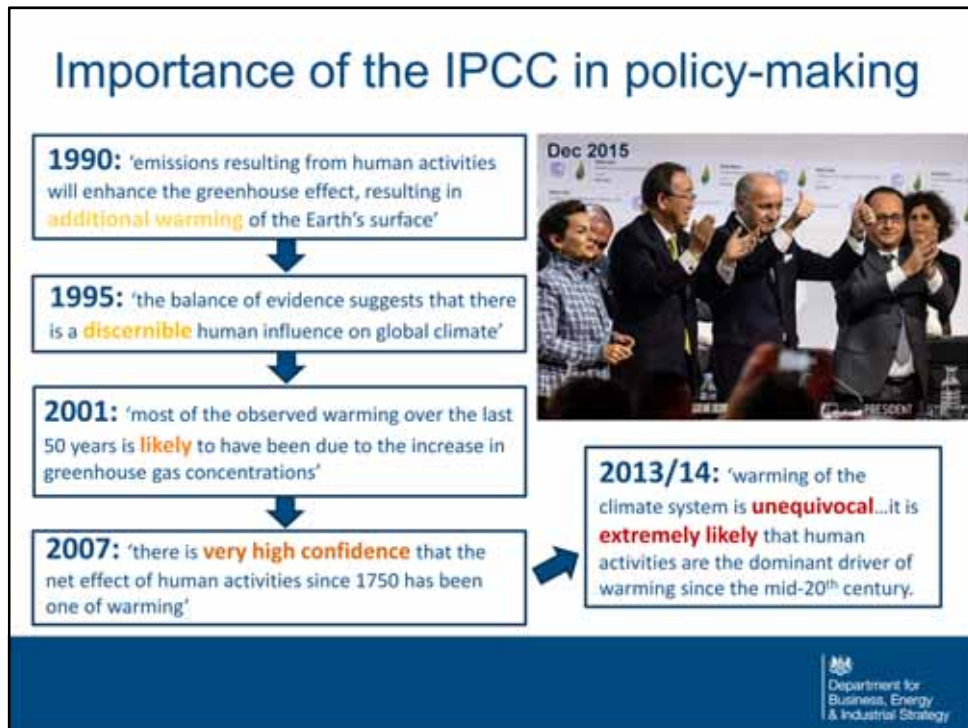
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Policy influences all aspects of our lives. Because it forms such an integral part of our society it is essential that good policy is based on, and informed by, the best available science.

Broadly speaking, policymakers are any person or group that can influence or change policy decisions. This includes the press, other media, the public, government ministers and officials, managers, scientists and NGOs. All of these groups influence policy decisions that are made by governments and shape the policy that we live with. Under the tight time constraints often imposed, these decisions are based on information that appears reasonable, communicates a clear message and is available at the right time. Evidence is only one contributor in a policymaker's decision process. It is important to understand that other factors – societal values, economic considerations, international relations, political landscape etc, are all major influencers.

To enable policy decisions to be based on the best scientific evidence, scientists need to actively communicate their results clearly and to a much broader audience, reaching beyond the traditional process of peer review and publishing. Otherwise there is the risk that scientific evidence and the key messages could be modified, manipulated, discredited or rejected by other key players in the policy making process.

Before I go on to talk about ways that you can work with the science team at BEIS, I thought it would be helpful to give a few examples where scientific evidence is used to inform policymaking, starting with the importance of the IPCC.



The IPCC provides the most comprehensive and authoritative assessments of the scientific and technical aspects of climate change. The scientific evidence in the first IPCC Assessment Report of 1990 underlined the importance of climate change as a challenge requiring international cooperation to tackle its consequences. It therefore played a decisive role in leading to the creation of the United Nations Framework Convention on Climate Change (UNFCCC), the key international treaty to reduce global warming and cope with the consequences of climate change.

Photo: The IPCC's first assessment report, which stated 'emissions resulting from human activities are substantially increasing the atmospheric concentrations of greenhouse gases' led to calls by the IPCC and the second World Climate Conference for a global treaty. Photo taken from a [timeline](#) of the convention on the UNFCCC website.

Confidence in warming as a result of human influence has grown in each successive Assessment Reports of the IPCC. The most recent report published in 2013-14 stated that 'warming of the climate system is *unequivocal*...it is *extremely likely* that human activities are the dominant driver of warming since the mid-20th century'

IPCC assessments underpin the climate negotiations under the UNFCCC. At the UNFCCC COP in Paris in 2015, governments from 195 countries agreed to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C". The Paris Agreement for the first time brought all nations together in a common cause towards a low-carbon, resilient and sustainable future.

The importance of the IPCC

- An assessment of the current literature
- Policy relevant, not policy prescriptive
- Clear, succinct summaries for policy makers
- 195 parties signed up to the findings
- Scientists have the final word



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Scientists from all over the world contribute to the work of the IPCC on a voluntary basis. Over 830 authors worked on AR5, which encompasses over 50 chapters. IPCC provides policymakers with an assessment of the current literature. Helps us consider the balance of evidence and reduces any bias from consideration of any single paper.

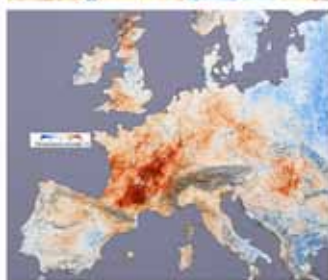
One of the unique features of the IPCC is that the text of the Summaries for Policy Makers (SPM) of its reports are agreed by consensus of all participating governments. This is achieved through a review process of the entire document during which governments can submit written comments, followed by negotiation in a Plenary session spanning several days. The end result is statements about the latest climate science and mitigation/adaptation action which are largely accepted without question by all governments. It enables negotiations in the UNFCCC to proceed unhindered by disputes about the science of climate change. These IPCC findings often form the basis of many national and international publications.

The IPCC is a scientific body under the auspices of the United Nations (UN). It was formed in 1988 by the WMO and UNEP, is open to all member countries, and has 195 members. The work of the organisation aims to be policy-relevant and yet policy-neutral, not policy-prescriptive.

The IPCC's work is carried out entirely independently by climate science experts from around the world, supported by a small secretariat. The reports which it issues are 'approved' by the governments of participating member states, but in such a way that the scientists always have final authority.

This means that the IPCC's reports not only have great scientific authority, but also have political sign-off as well, meaning that governments involved in climate negotiations have agreed that the contents can be used as evidence.

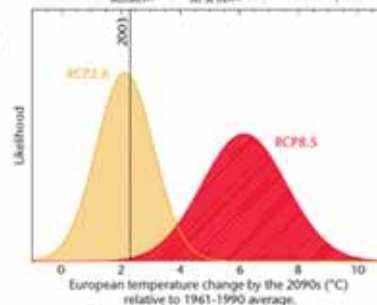
Example: extreme event attribution



Human contribution to the European heatwave of 2003

Peter A. Stott¹, D. A. Staneke^{2,3} & M. R. Allen²

¹Met Office, Had
Meteorology
²Department of
³Department of



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Policy decisions are not based around the findings of a single paper, but rather are informed by widespread scientific consensus following independent evaluation of all available evidence. That said, individual papers can have a big impact and can steer the direction of future science. A good example of this is around the development of extreme event attribution. Following the devastating heat wave in Europe in 2003 that caused an estimated 70,000 additional deaths, Peter Stott's paper the following year in *Nature* showed for the first time that the likelihood and severity of that event had been increased as a result of anthropogenic climate change. This paper estimated that human influence had at least doubled the likelihood of a heatwave of that magnitude occurring. This paper was instrumental in the development of a new field of research – extreme event attribution, and since 2012 BAMS have published an annual report which assesses individual events around the world and estimates how much more likely or more severe each event was as a result of human influence on the climate.

These assessments are hugely important – they tell us about future risks and enable governments to protect society through adaptation as well as mitigation. The reason this paper resonated so well with ministers and the media was because it linked the 2003 event with the future – showing that European-wide temperatures like the 2003 heatwave would become common by the 2040s. As a result, buildings and infrastructure need to be resilient to high temperatures, air conditioning and water need to be available, etc.

Understanding the impacts of climate change on individuals, and the future risks, is critical in driving action – so communication is key! E.g. effective policies to reduce emissions will save lives by substantially reducing the risks from extreme high temperature events. Demonstrating, and if possible quantifying, avoided risks as a result of mitigation action helps policy makers to weigh up the factors in front of them. Making, and reinforcing, these links is critical.

Tips for translating (climate) science into policy



1. Build and maintain relationships
2. Create opportunities for dialogue, and deliver science to order
3. Tailor clear and concise communication to your audience
4. Show the human face - tell personal stories of scientists; show impacts of climate change on people
5. Work with a diverse range of partners
6. Engage with the media
7. Attend and host events
8. Have a good website and embrace social media

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Relationships: Use existing contacts and networks to bring your science to the attention of policy makers early in the programme, and maintain this engagement actively. The aim is to become a trusted, reliable channel of information. Science advisors want trusted generalists, who are able to discuss (or quickly find information about) a wide range of topics and who can understand their needs (communicating clearly and impartially, judging appropriate level of detail, topic relevance – what may be surprising, important or useful to them).

It can be hugely beneficial to have senior researchers on Steering and Advisory committees, e.g. MSCC. Consider NERC fellowships and secondees into policy/evidence teams in government departments.

Dialogue: Conversations throughout the life cycle of a project is where most impact comes from, rather than lengthy reports. Continuous dialogue is an essential component of building effective relationships and delivering policy relevant science. Take all opportunities to discuss topics in person and get feedback. Identify who the user is, find out their needs and tailor delivery to that, involving them in the process (and in setting original research questions). For example, consider holding a policy briefing in BEIS or Defra to discuss research activities and policy relevant outputs with key stakeholders in government.

Tailored information: Communication materials must be concise and clear, tailored to the audience. Long, technical reports will never be read. Think about circulating regular newsletters for external stakeholders, with periodic overview and synthesis of key project topics/publications; press releases; non-technical summary reports (brochures, fact sheets, short videos, infographics).

Human element: more likely to be trusted by public; human stories also help

communicate impacts of climate change and the 'so what?'

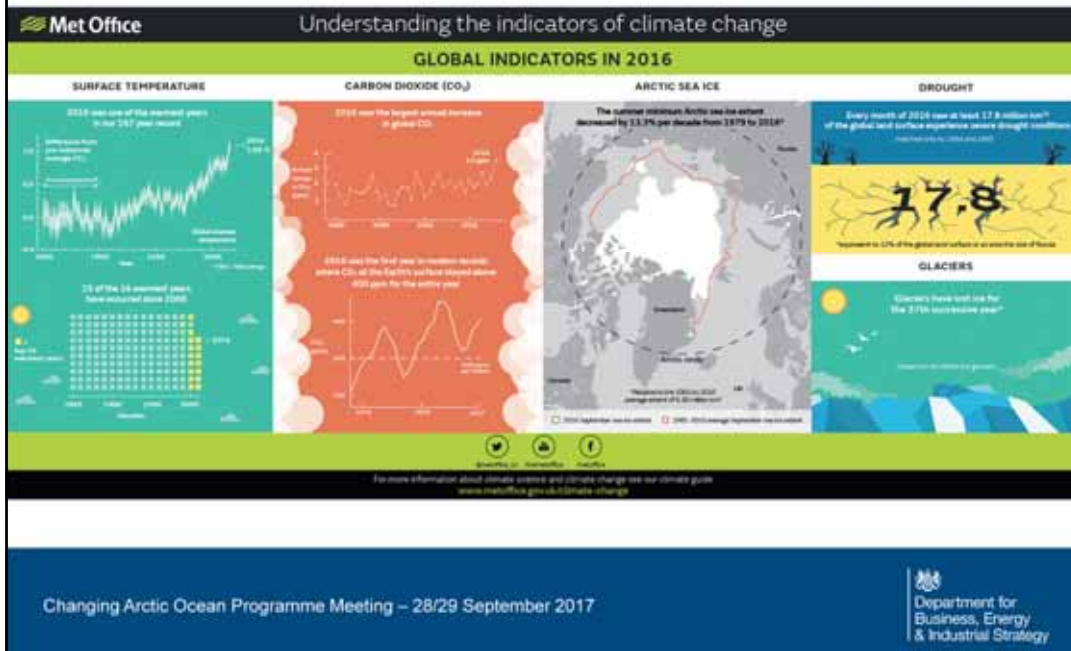
Diverse partners: important to show wider context of work, and scientific authority (e.g. IPCC reports). How does this fit in with wider evidence base?

Media: It is important to actively build relationships with the media. The scientific advisors to policy makers such as the Government Office for Science and the Parliamentary Office of Science and Technology often rely on media reporting to provide and filter information (due to their lack of time and access to primary literature)

Events: Events can be a key tool for building the necessary networks to base relationships on so it is important to identify relevant events and ensure an appropriate presence. This includes events outside of the traditional science area and can be a useful way to build a network of potential sample audiences for future publications. Collaborating with the hosts of key events is another opportunity to build or strengthen relationships and dialogue. Conferences provide opportunities for presentations and one-to-one meetings alongside the formal proceedings.


Web presence: active website where information can clearly be found - e.g. introduction to the programme with project-specific content; regular news updates and editorials; social media activity; personal narratives. Make it easy for us to find you!

Use clear, engaging graphics!



Many examples of these – this is the infographic developed by the Met Office to summarise the key findings from the BAMS State of the Climate in 2016 report. This was widely circulated in BEIS and Defra and Ministers are keen to see more of these!

How to work with BEIS



1. Make yourself known to us!
2. Be a trusted expert (and available at short notice...)
3. Know your audience – some of us are scientists, some generalists – avoid technical language
4. Provide relevant, concise information, answering specific question – background can be provided in an annex
5. Collaborate with other experts in the field
6. Engage with the IPCC
7. Be aware of the policy landscape

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Biggest challenge is finding a contact point. We often attend conferences, Royal Society events, etc – come and talk to us! My email address is on my final slide, please get in touch and I will point you in the right direction.

Consider NERC knowledge exchange fellowship/seconded into BEIS evidence/policy team.

Seminars at BEIS. Be available to help with PQs, correspondence cases, briefings etc – some of these require information in less than 24 hours

We want to build a network of experts that we can call on when needed – at the moment we have excellent relationships with the Met Office, BAS, etc, but looking to expand this to cover the wide range of science that we are involved with.

Be aware of the policy landscape – check out Parliament UK website for open calls for evidence (and contribute to these debates); subscribe to the quarterly magazine of the UK Parliamentary and Science Committee; subscribe to email alerts and policy publications (UK Commons Library, POSTnotes, UK Parliament recent Select Committee publications; UN Climate Change Newsroom).

Arrange a policy briefing in BEIS/Defra early in the programme, and annually. E.g. the Marine Ecosystems Research Programme (funded by NERC and Defra) held an event for policy makers at Defra yesterday, providing an opportunity for research leads to discuss the programme with a range of stakeholders. This involved an overview of the programme and an overview of Defra policy needs and issues, followed by a more detailed discussion of particular research areas and where they tie in to policy. Prior to the meeting, a short briefing document had been circulated, with information under clear headings, e.g. ‘what is the problem?’ ‘what are the aims of the programme?’ ‘specific examples of policy-relevant outputs’ ‘examples of products that policy makers could use’. Make it easy for policy makers to see how the science can inform policy, what the outputs could be – i.e. provide solutions as well as problems.

How can the NERC CAO programme inform future policy?

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CSA climate science evidence gaps



1. Present weather and climate risks globally and within the UK.
2. Future climate over this century under different emissions scenarios globally and within the UK, including extreme weather events.
3. Climate risks and impacts from future climate variability and change
4. Emission pathways compatible with different levels of warming including timing of achieving net-zero emissions.
5. Impacts and opportunities of mitigation and adaptation.
6. The case for early action: implications of delaying mitigation actions.

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The scientific evidence of climate change is strong, but to help plan for the future there are areas of uncertainty where further research is needed. In response to this need, and to provide evidence for the UK government, the CSA network has endorsed six research requirements: see slide.

GO Science marine science priorities

- Reducing uncertainty around regional sea level rise (UK)
- Interactions between different stressors, and their cumulative impact on the environment, e.g. Ocean warming and acidification
- Tipping points – will marine ecosystems be able to recover?
- Value of marine assets and resources
- Environmental impact of emerging sectors



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In preparing for this talk, I spoke to a number of teams in BEIS to find out what their research needs might be over the coming years, and where the CAO programme might be able to help provide evidence to meet these needs. GO Science highlighted their research priorities relevant to marine science:

- Reducing uncertainty around regional sea level rise (UK)
- Interactions between difference stressors such as ocean warming and ocean acidification, and their cumulative impact on the environment
- Tipping points – will marine ecosystems be able to recover?
- Value of marine assets and resources
- Environmental impact of emerging sectors

The UK is in a strong position to lead the global effort to address uncertainties around the exact nature and impact of climate change, including polar and oceans. Uncertainty is related both to the output from climate models (e.g. projections for global sea level rise under one emissions scenario (RCP 2.6) range between 22.5 cm and 47.5 cm) and to international policy action to reduce greenhouse gas emissions. This uncertainty affects our ability to mitigate and respond to the threats from climate change. For example, there is uncertainty about the extent of sea level rise, potentially the marine environment change with the greatest implications for the UK. This is primarily linked to uncertainties about the severity of global warming, and a lack of understanding of how ice sheets are affected by global temperature rise. This has significant implications when ensuring the resilience of critical coastal infrastructure. Nuclear power stations, for example, are required to have defences that protect them from 1 in 10,000 year flooding events, but our certainty about the frequency of these

events changes over time.

From the perspective of biodiversity loss, many questions remain about its current state in the UK, for example the location of sea bed habitats. This makes it difficult to track how marine biodiversity is impacted by environmental changes. The extent to which we rely on ecosystems for goods and services is also poorly quantified, and valuation of the marine environment will need interdisciplinary research from the natural and social sciences.

While impacts of many of the stressors on the marine environment have been studied individually, little attention has been given to the way they interact. There is a possibility that some marine ecosystems will reach a threshold of irreversible change, although what these 'tipping points' look like is currently unknown.

Finally, there is uncertainty about the potential impact of new economic activity in the shelf and deep seas, for example deep sea mining and large scale extraction of offshore energy. Given the growing demand for marine resources, which makes it likely that these industries will develop, it is crucial that policy-makers and industry are empowered to make the best possible decisions about them.

Questions?

You can also email me: catherine.cole@beis.gov.uk

....or from 1st Nov: catherine.cole@metoffice.gov.uk