

BEIS Climate Science Research Priorities

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Agenda

1. Energy & Climate Science Team in BEIS
2. Climate science informs UK policy
3. Clean Growth Strategy
4. Research Priorities
5. Climate Research Case Studies



1. BEIS Energy & Climate Science Team: What do we do?

- Scientific advice to Ministers & policy teams across UK government
- UK focal point for Intergovernmental Panel on Climate Change (IPCC)
- Lead UK government review for the IPCC reports on land & oceans
- UK Greenhouse gas inventory lead
- Commission climate research & with the research community, UKRI & our Chief Government Advisers
- Co-fund the MOHC Climate Programme
- Head of the Secretariat for Mission Innovation

2. How is climate science helping inform UK policy?



Scenarios towards limiting global mean temperature increase below 1.5 °C



Science and policy characteristics of the Paris Agreement temperature goal



Emission budgets and pathways consistent with limiting warming to 1.5 °C

ARTICLE

doi:10.1038/nature17145

Contribution of Antarctica to past and future sea-level rise

3. The Clean Growth Strategy: Our Climate Science research priorities

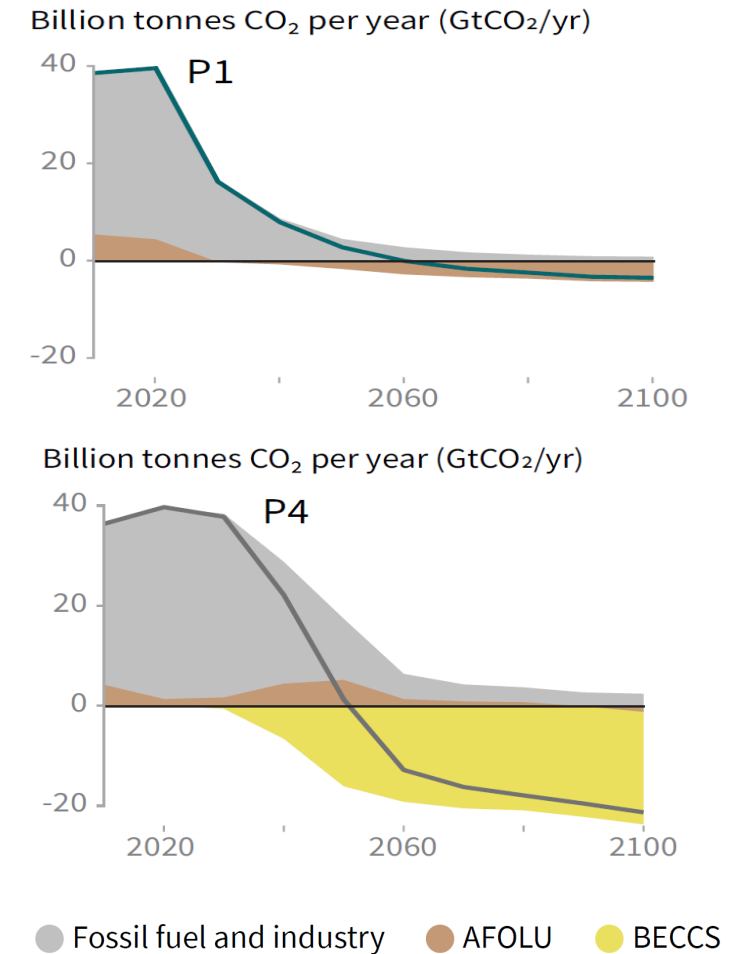
1. Present weather and climate risks globally and within the UK;
2. Future climate over this century under different emissions scenarios globally and within the UK, including extreme weather events³¹⁵;
3. Climate risks and impacts from future climate variability and change;
4. Emission pathways compatible with different levels of warming including timing and a consideration of technologies to achieve net zero emissions;
5. Impacts and opportunities of mitigation and adaptation; and
6. The case for early action: implications of delaying mitigation actions.



UK and international climate action is underpinned by a robust evidence base on the science of climate change. In this annex we summarise (i) the scientific evidence that reinforces the need for ambitious action to reduce emissions; (ii) the scientific rationale behind the internationally-agreed global temperature goals; (iii) UK climate action; and (iv) future scientific priorities from a UK government perspective.

4. Mitigation Research

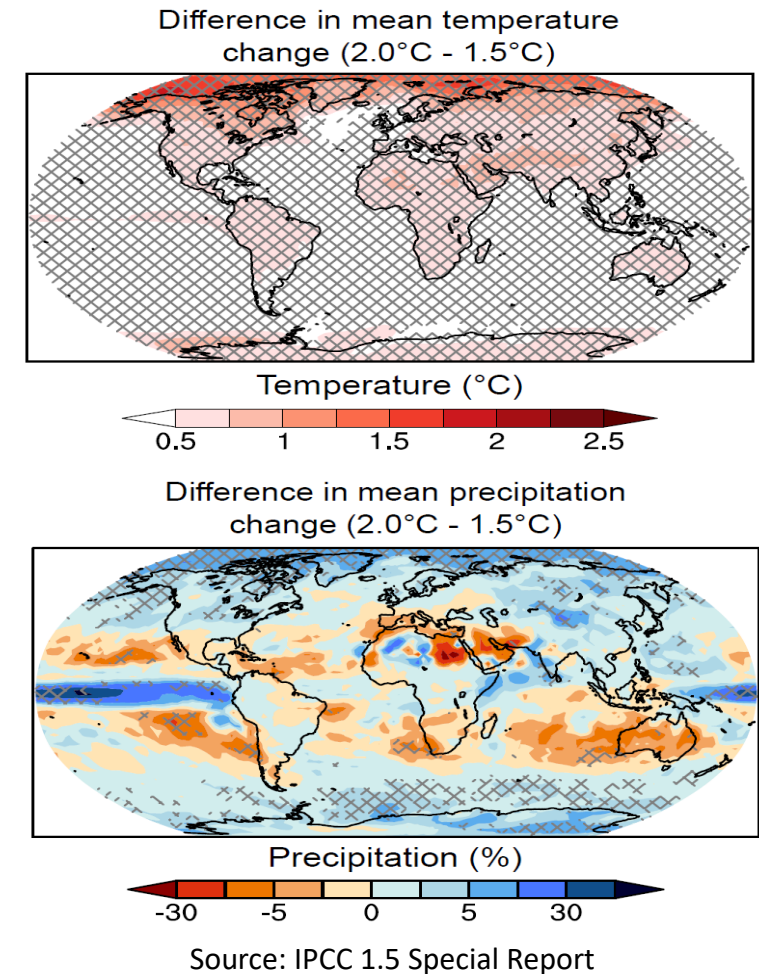
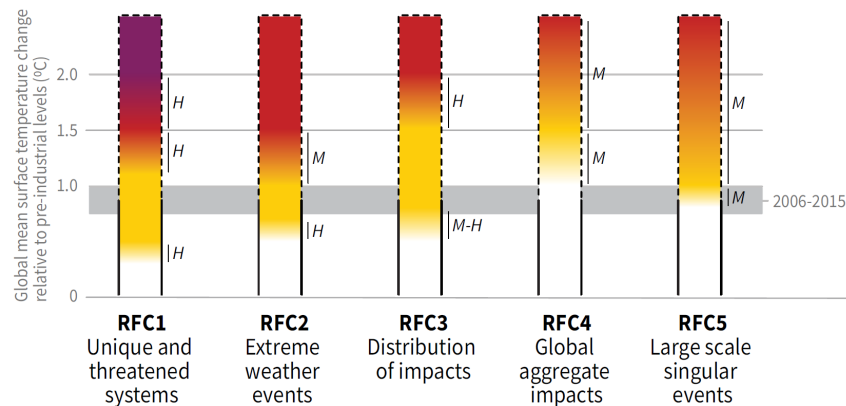
- Analysis of mitigation pathways to strengthen the case for raised short-term ambition
- How do mitigation pathways interact with wider Sustainable Development Goals?
- Understanding the drivers of Paris-consistent pathways e.g. the role of short-lived climate forcings, trade-offs of bioenergy
- Science support for mitigation related innovation – e.g how to innovate to reduce cost of growing bioenergy feedstocks & how to grow them sustainably?



Source: IPCC 1.5 Special report

Impacts Research

- More sophisticated impact models – what are the consequences of 1.5 overshoot or non-linear responses
- Cumulative and interacting stresses and risks
- Better tools for adaptation and resilience at regional & local levels



Land Use, Land Use Change & Forestry (LULUCF) Research

- How can we reduce key uncertainties in LULUCF emission estimates in the UK – e.g from peat & wetlands & fires
- How carbon removals may evolve in a changing climate – for example from future tropospheric ozone trends



Earth Observation Research

- Continue to develop methodologies to verify the UK GHG Inventory
- Stimulate Earth observation capability to support delivery of the Paris Agreement
- Monitoring land use change and associated emissions
- Robust data for ocean-related policies



Greenhouse Gas Removals (GGR) Research

- £8.6 M NERC-led GGR research programme over 4 years with £330K from BEIS
- Improved understanding of fundamental science:
 - BECCS sustainability
 - Soil carbon
 - Alkaline industrial wastes (e.g. from iron & steel)
 - Accelerated weathering
- How can we robustly monitor and verify carbon removals?
- How can we incentivise GGR technologies responsibly?



Behavioural Research

- Understanding public & private sector attitudes to climate change to shape effective communication of the science
- What level of public & private sector acceptance is there of the need for transformative mitigation? How might attitudes be shifted?



Fundamental Research: Improving climate models

More than doubled layers in the atmosphere to help capture more detail.



Layers in the ocean have almost doubled – helping to capture mixing between different levels.

New code simulates clouds, a major driver of global climate, more accurately than ever before.

OBSERVATIONS

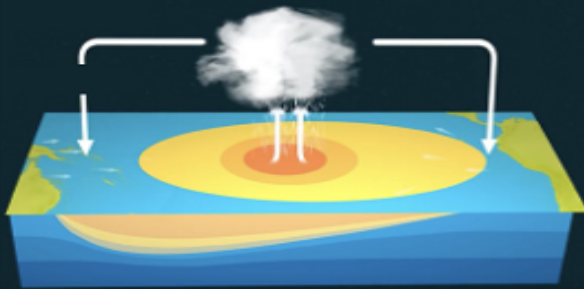
MODEL



Oceans are represented in 25x more detail – helping to capture ocean currents and eddies with greater accuracy.



Better representation of key natural cycles of variability – such as El Nino and La Nina.



Captures northern hemisphere jet stream more accurately – helping simulate storm tracks and regional climate.



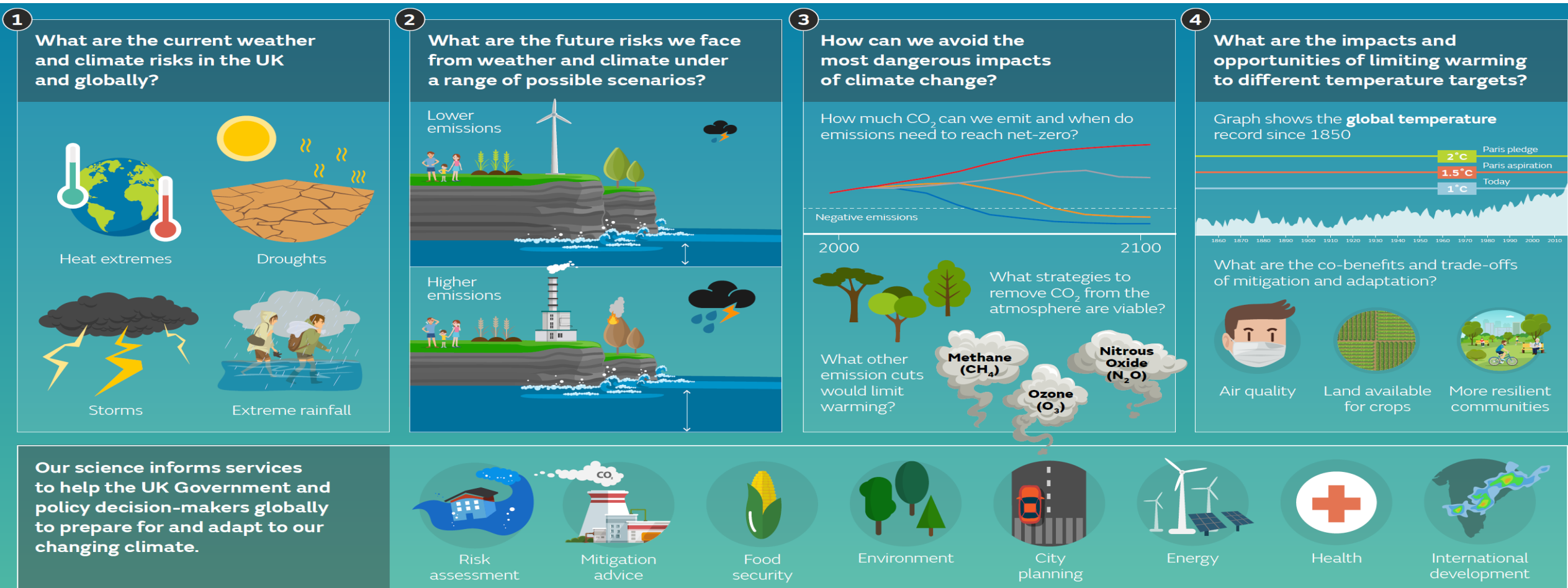
New model simulates changes in ocean circulation under Antarctic ice shelves, preparing the way for more confident estimates of sea level rise



Better representation of variability in Arctic sea ice cover which is important for projecting change in regional climate.



5. Case Study 1: MOHC Climate Programme 2018-21

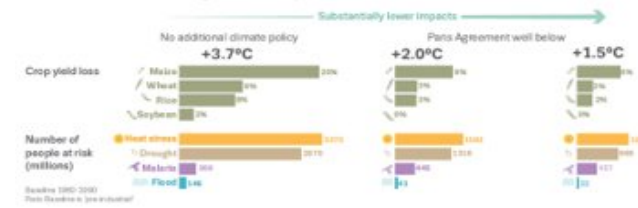


Case Study 2: Pathways to Paris

- £450 K Tyndall Centre/NERC/BEIS project covering challenges of decarbonisation to limiting warming to 1.5 & the impacts
- Covered a range of topics from carbon budget size, to permafrost feedbacks to sea level rise.
- 22 papers published, 12 in IPCC's 1.5 Special Report

Reduced climate impacts from the Paris Agreement

The lower the rise in global temperature the smaller the risks



Climate risks differ by region, with 2°C risk bigger than 1.5°C

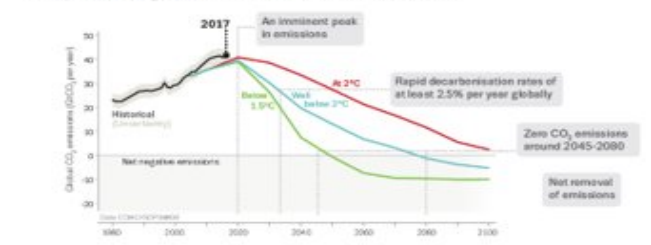


Economic losses are reduced by the long term goal of the Paris Agreement



Decarbonisation to meet the Paris Agreement

Future projected global CO₂ emissions that meet the Paris Agreement temperature goal have these characteristics...



Many countries in Europe, and the US, have decreased their CO₂ emissions from fossil fuels



Many mitigation opportunities exist including for transport...



Credits: Cui Guohua (UKA), M. Sharmeen (University of Manchester), C. Wilson (UKA), L. Whitworth (UKA). Data: van Vuuren 2017 and the Global Carbon Budget. Design by Anna Morris. Graphics by Nigel Hawton. Tyndall Centre UEA

Case Study 3: Climate impacts between 1.5°C and 4°C

- £250 K BEIS funded project led by the Tyndall Centre (Oct 18- March 2020)
- What are the risks and impacts of climate change at a country level for levels of global warming at every 0.5 °C between 1.5°C and 4°C?
- Climate Impacts analysis in Ghana, Ethiopia, India, Brazil, Egypt, China
- Aim: results will feed into the IPCC Sixth Assessment Report 2021 to inform Global Stocktake 2023



Thanks for listening

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