

21st Century Challenges: Resilience to Climate Change

Who pays and who benefits?

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Head of Adaptation

Committee on Climate Change

Royal Geographical Society (with IBG) Seminar

17th November 2015

Statutory roles:

- **To provide advice to Government** on the Climate Change Risk Assessment (advisory role)
- **To report to Parliament on progress** by the National Adaptation Programme (scrutiny role)



Prof Lord John
Krebs (chair)

Sir Graham
Wynne



Prof Sam
Fankhauser

Prof Martin
Parry



Prof Jim Hall

Prof Dame
Anne Johnson



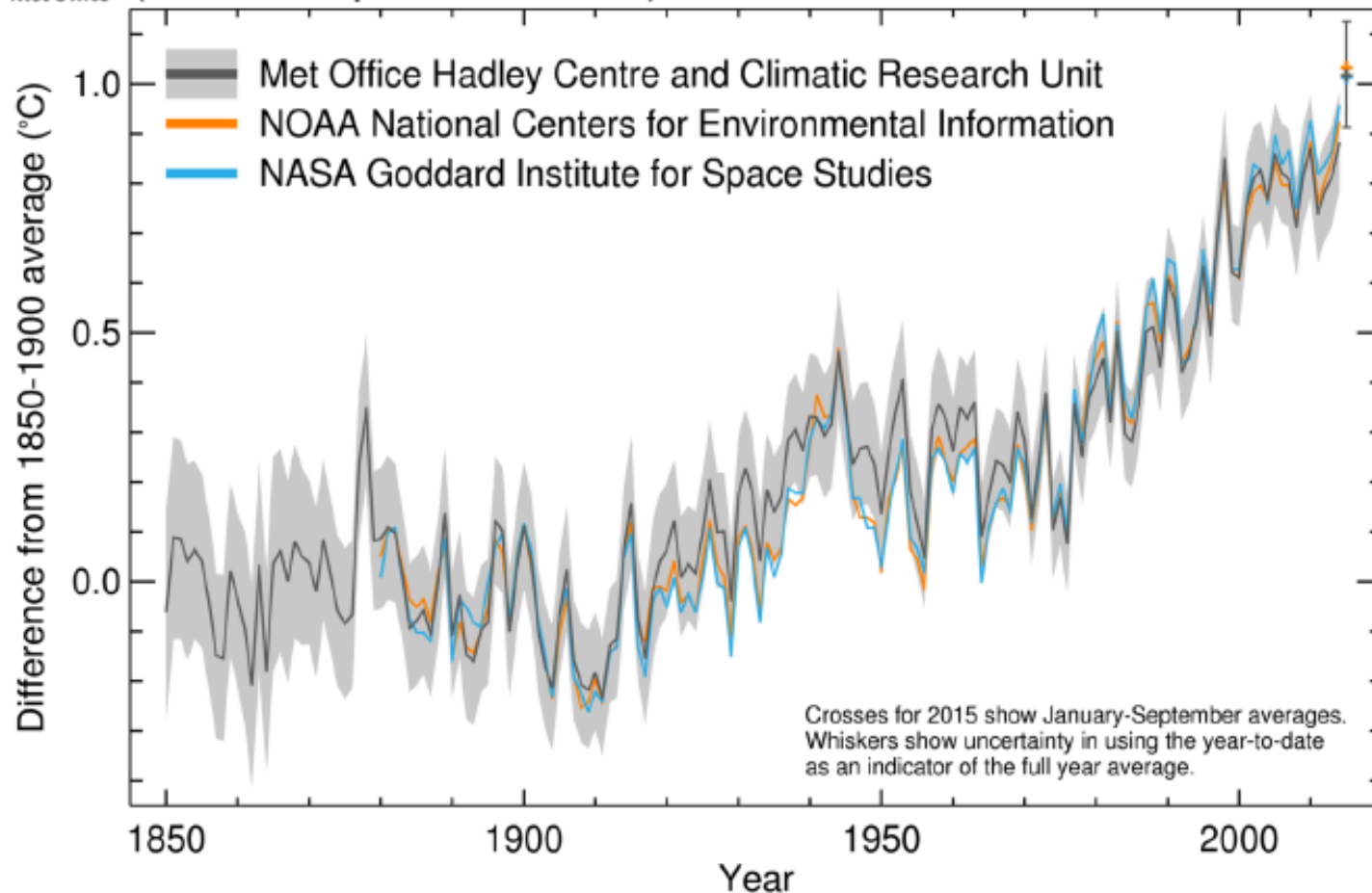


**LATEST CLIMATE
OBSERVATIONS AND
PROJECTIONS**

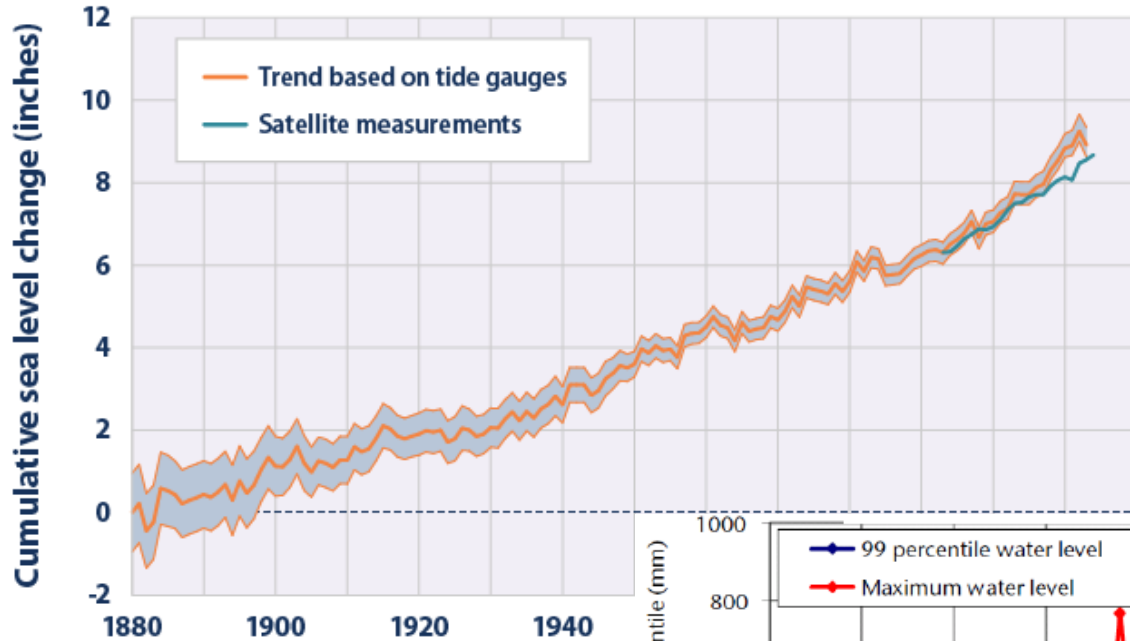
2015 will be the hottest year on record, marking the halfway point to the 'safe limit' of 2°C global temp rise



Global average temperature anomaly (1850 - September 2015)

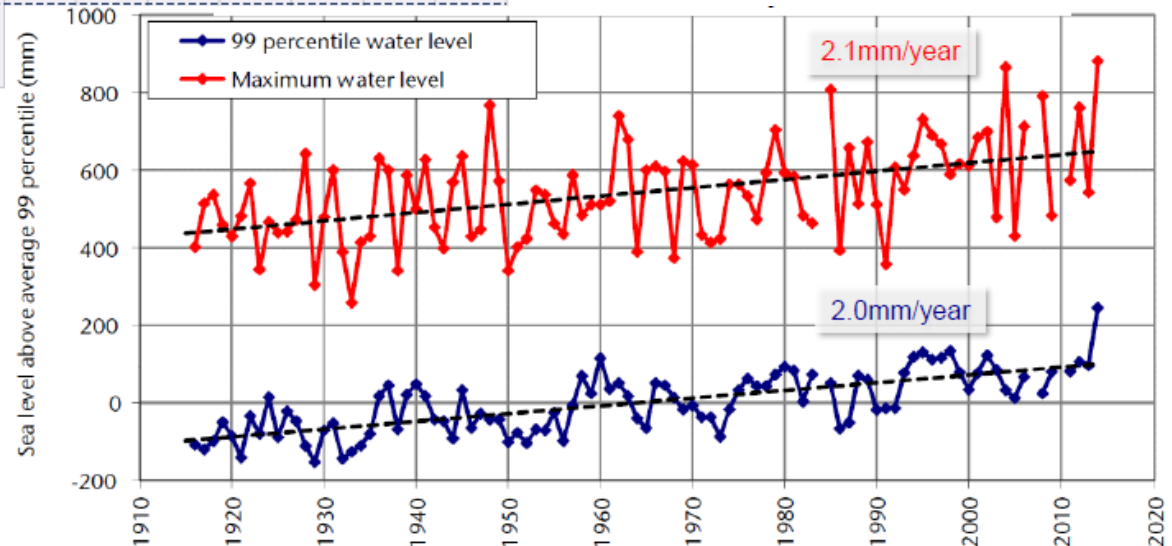


Sea levels have risen 20 centimetres since 1901, with the rate of increase accelerating in recent decades

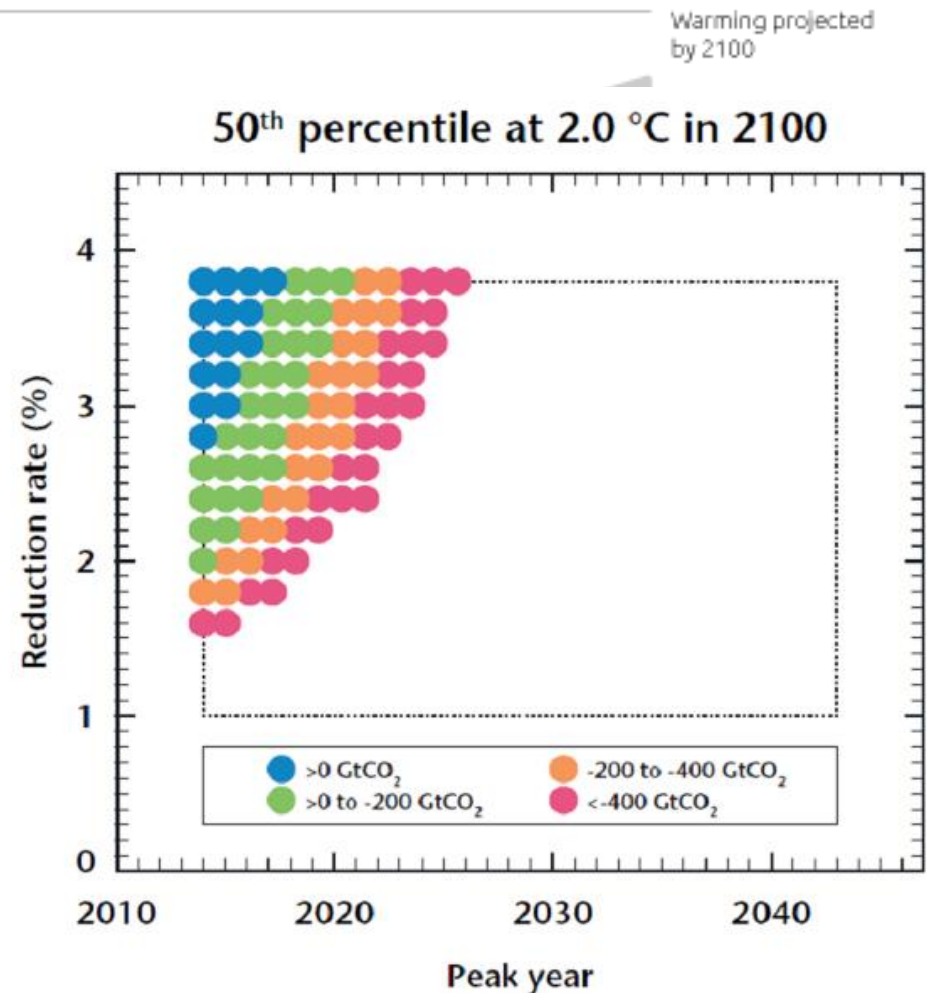
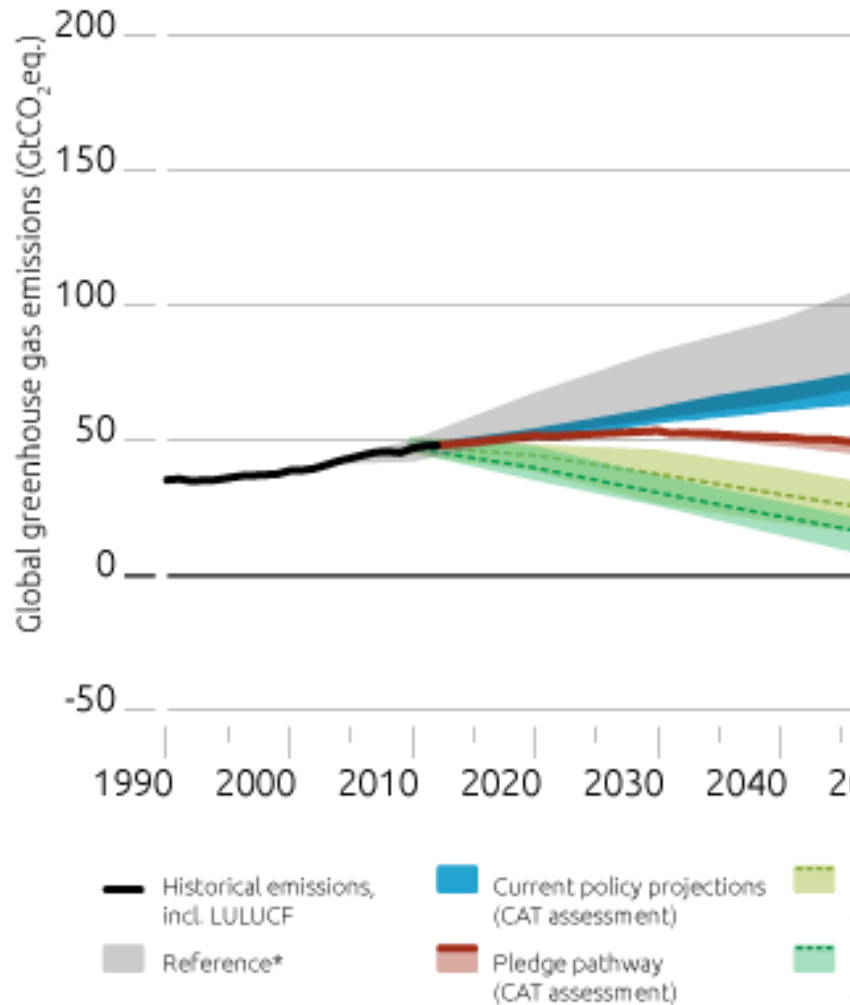


Global mean sea level rise, 1880-2014

Sea level rise at Newlyn, Cornwall

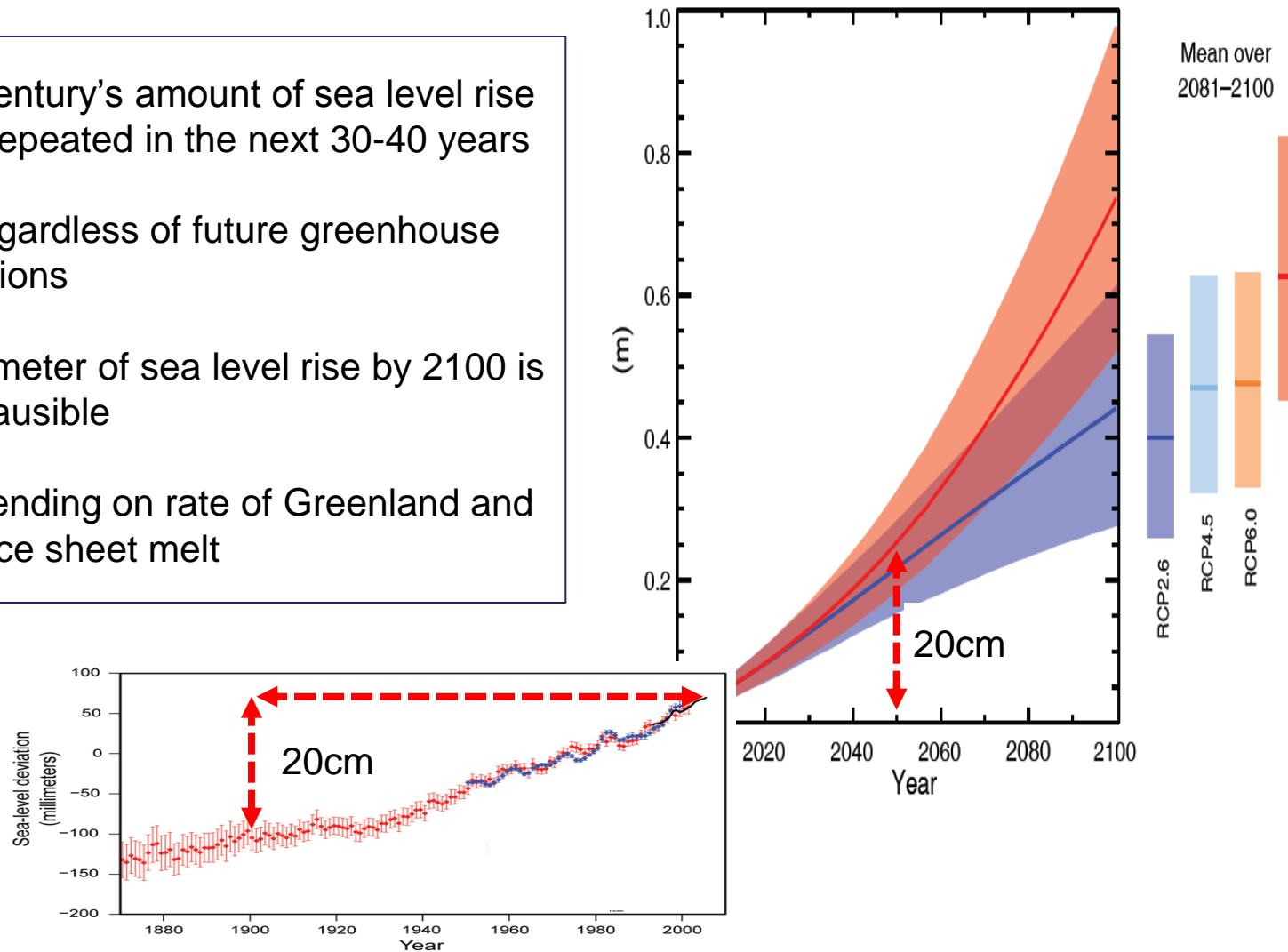


Remaining within 2°C increasingly unlikely. Now passing the point at which 2°C remains possible without negative emissions technologies

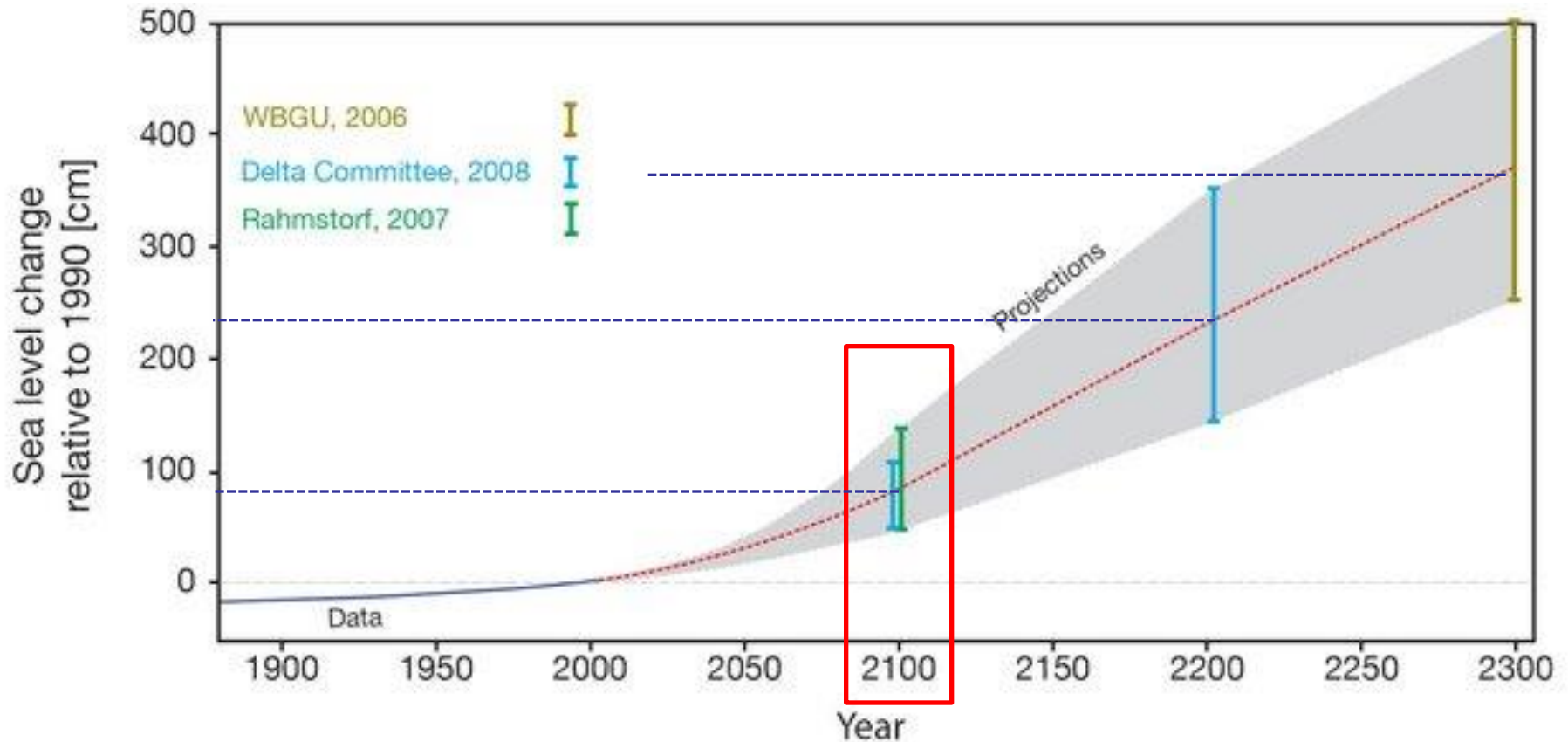


Lag in the Earth's climate system means the majority of impacts are yet to come

- The last century's amount of sea level rise set to be repeated in the next 30-40 years
- Largely regardless of future greenhouse gas emissions
- Overall a meter of sea level rise by 2100 is entirely plausible
- More depending on rate of Greenland and Antarctic ice sheet melt



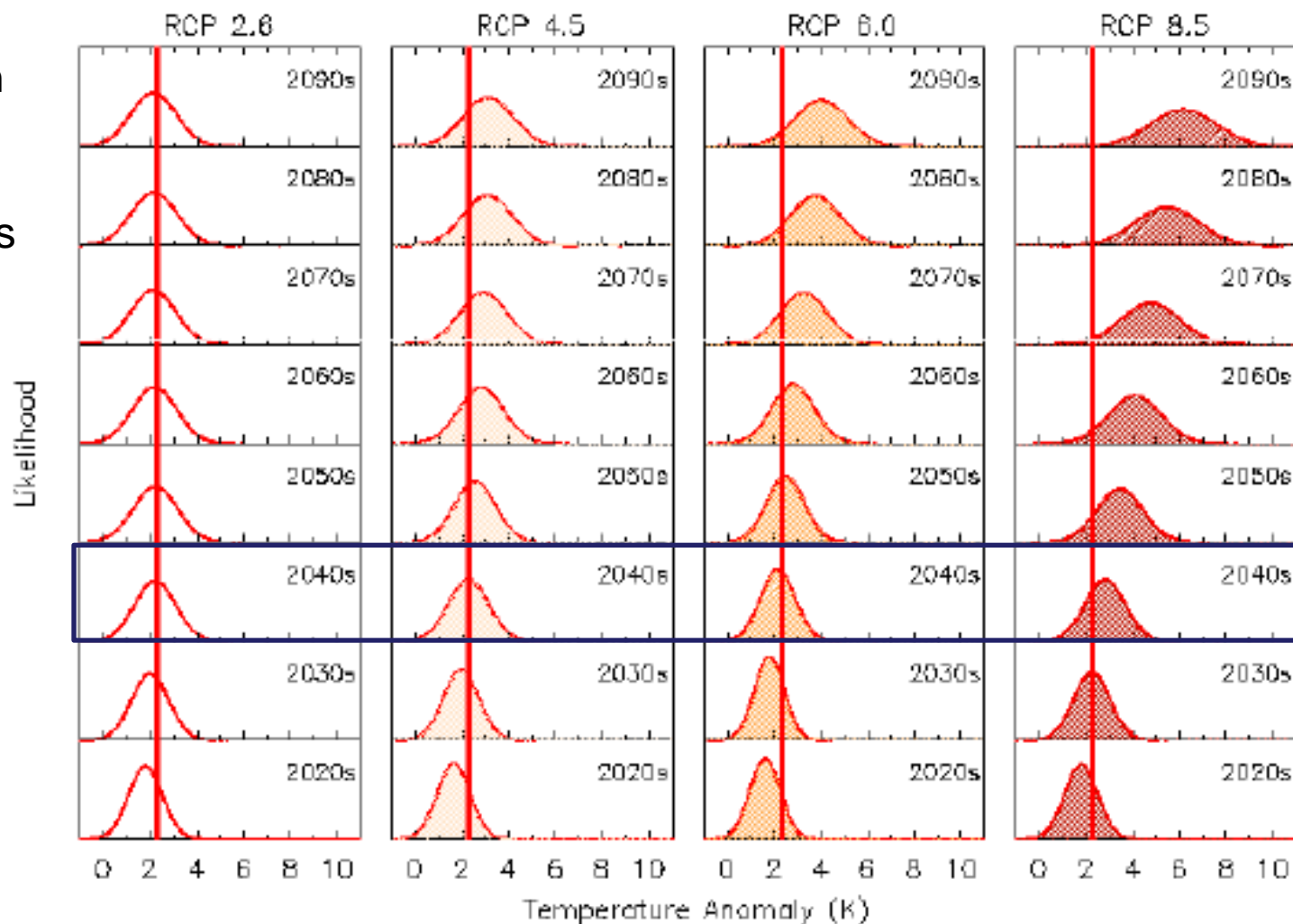
Sea levels will continue to rise until a new equilibrium is reached; several meters over the coming centuries



The rise by 2100 will only be a small beginning of a much larger, multi-century response of oceans and ice sheets to elevated global temperatures

Extreme heatwaves in Europe will become the norm by the 2040s

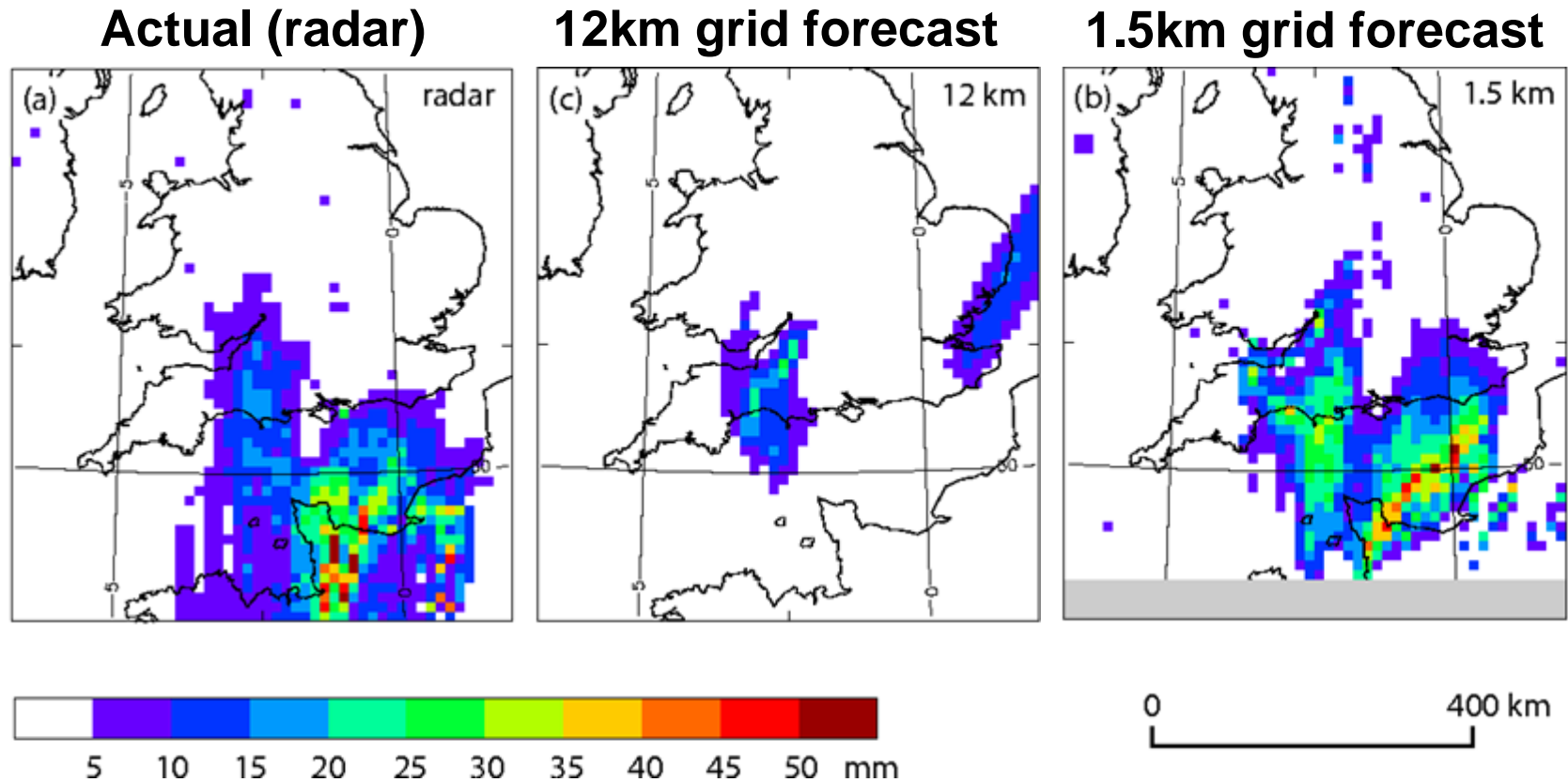
Summer mean temperatures for different GHG scenarios



2003 heatwave temperature anomaly

New very high resolution models coming online, showing higher chance of heavy summer rainfall

Rainfall during a five-hour period, afternoon of 27th July 2013



Intense summer rainfall (>30mm/hr) could be five times more likely by 2100

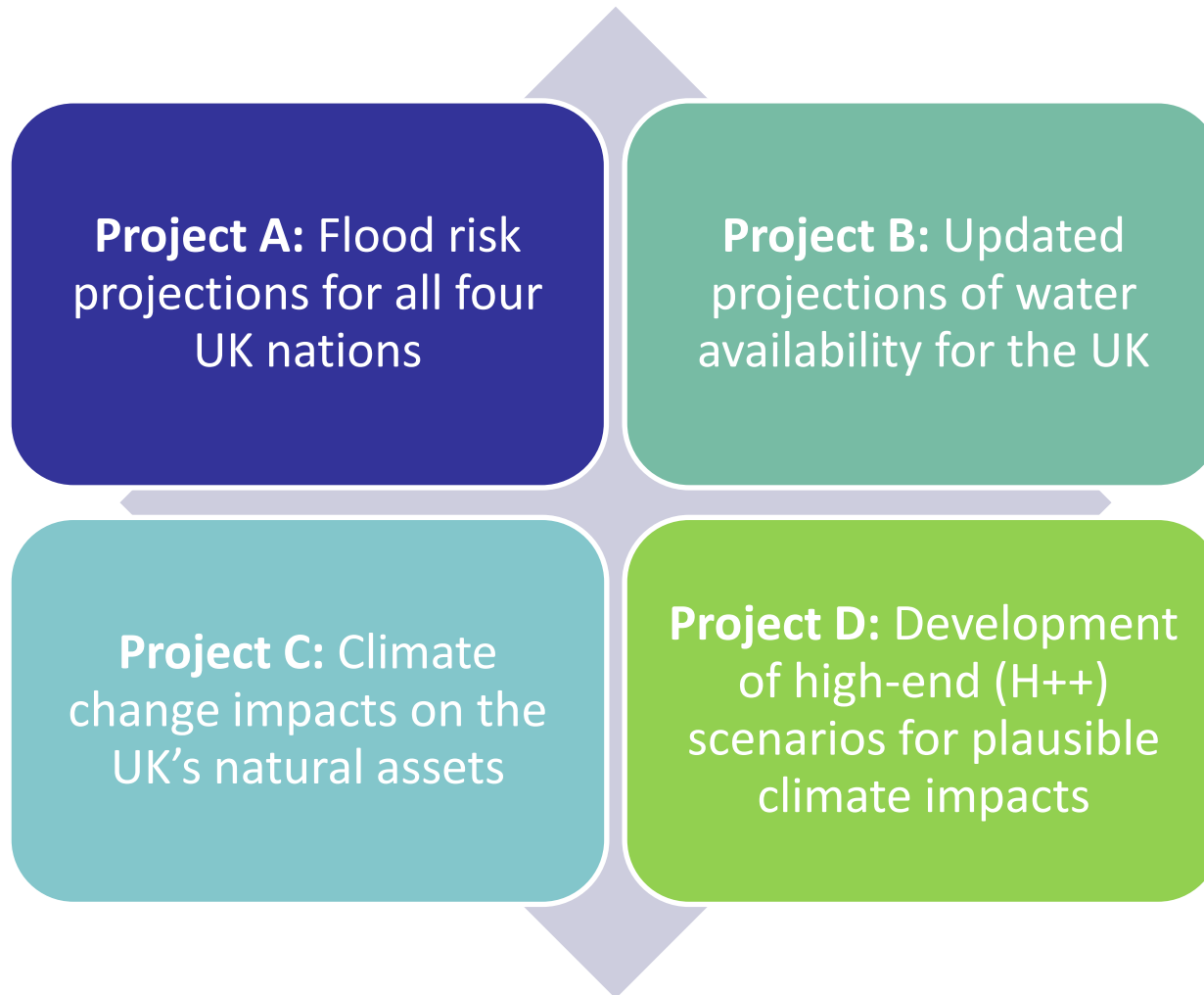


**UK CLIMATE CHANGE
RISK ASSESSMENT 2017**

‘EXAM’ QUESTION FOR THE CCRA EVIDENCE REPORT :

“Based on our latest understanding of current, and future, climate risks/opportunities, vulnerability and adaptation, what should the priorities be for the next National Adaptation Programme and adaptation programmes of the devolved administrations?”

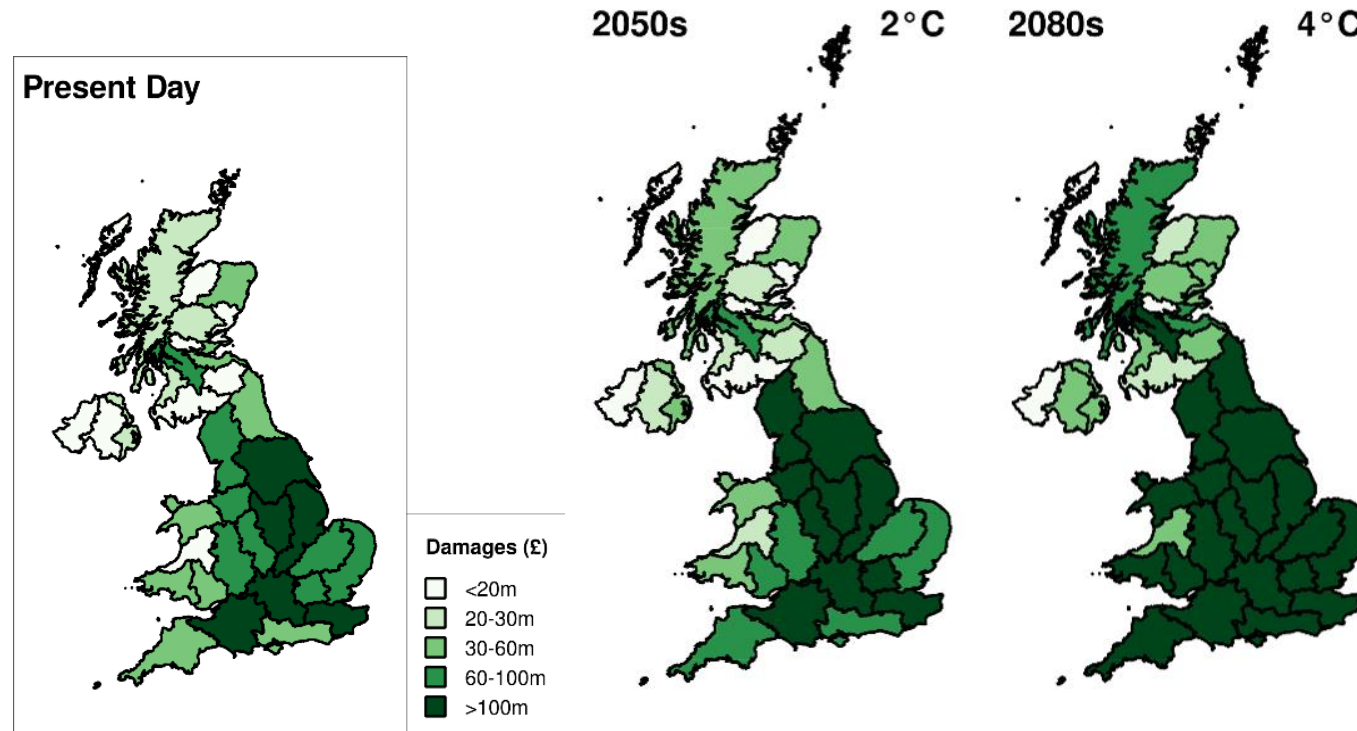
CCRA studies: four NERC-funded research projects



Results: Flood risks will increase even if current flood management approaches continue and there are no new homes in flood risk areas

Project A: Future flood risk

Expected annual damages (£ million) from river, coastal and surface water flooding



Assuming:

- Current levels of adaptation continue (ie. current policies and investment levels rise with inflation)
- No new development in the floodplain

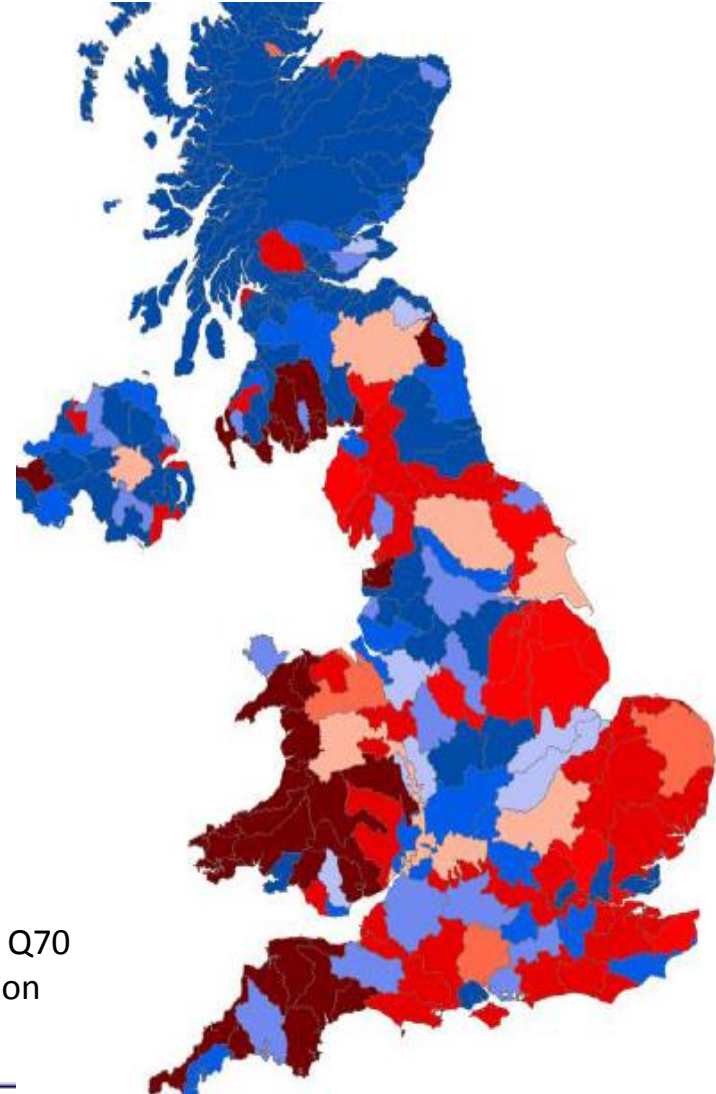
Results: Widespread risks of water restrictions even with strong adaptation policies and plans

- **Low population and medium climate scenario, assuming high levels of adaptation**

Areas coloured **red** have insufficient water to meet the demand 5-30% of the time, taking into account the requirements of the natural environment

Areas coloured in **burgundy** have no water available at all for abstraction due to environmental flow requirements

Current abstraction demand as a % of the available resource for supply in low flow conditions (average of Q70 & Q95 flows) in the 2080s under a 3.5°C, low population growth and high adaptation scenario



Results: New colonisations expected as species shift northwards. Upland areas most likely to see local species extinctions

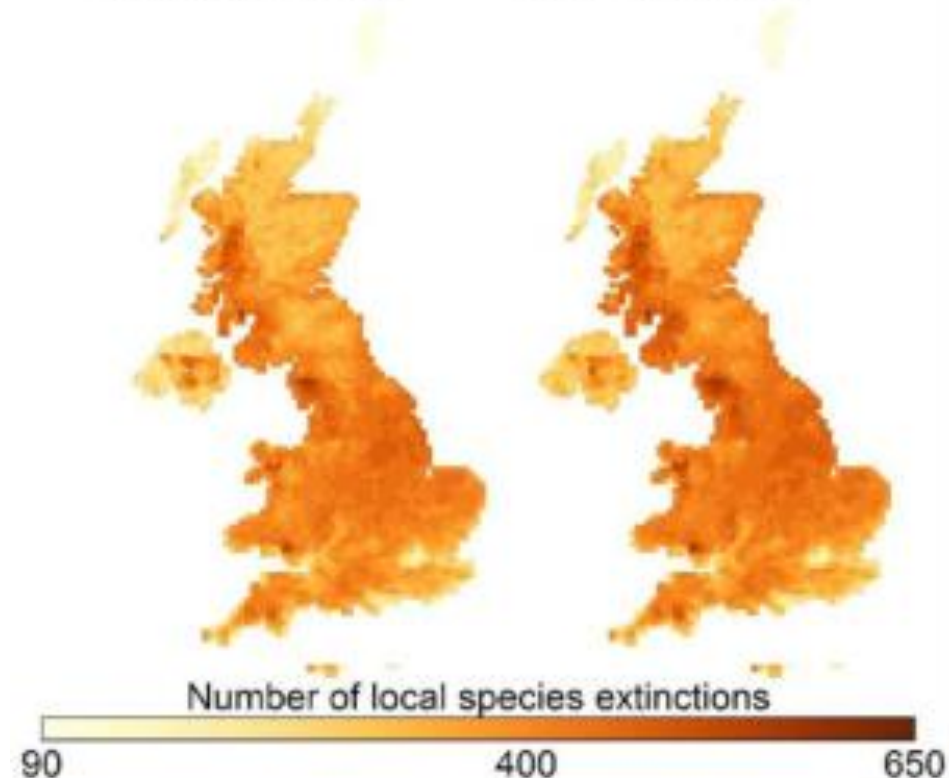
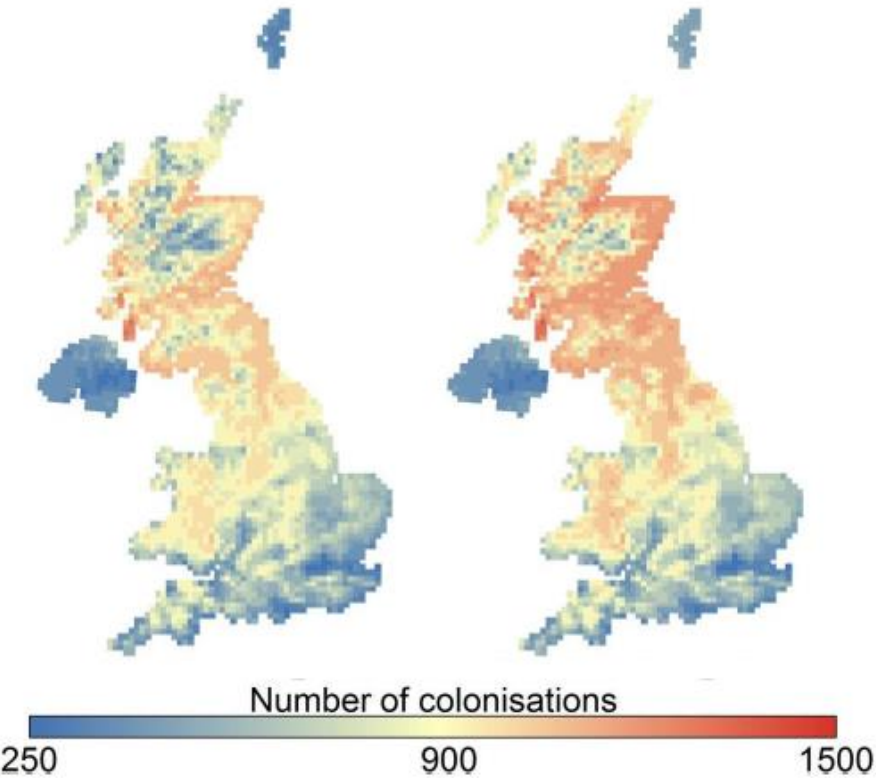
Project C: Impacts on natural assets

2 °C climate scenario

4 °C climate scenario

2 °C climate scenario

4 °C climate scenario



There will be winners and losers amongst species, with gains reliant on suitable good quality habitat being available. Species from mainland Europe will also colonise southern areas.

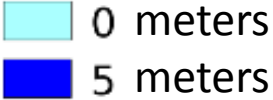
Results: Plausible high end (H++) climate change scenarios have been created to help stress-test adaptation plans

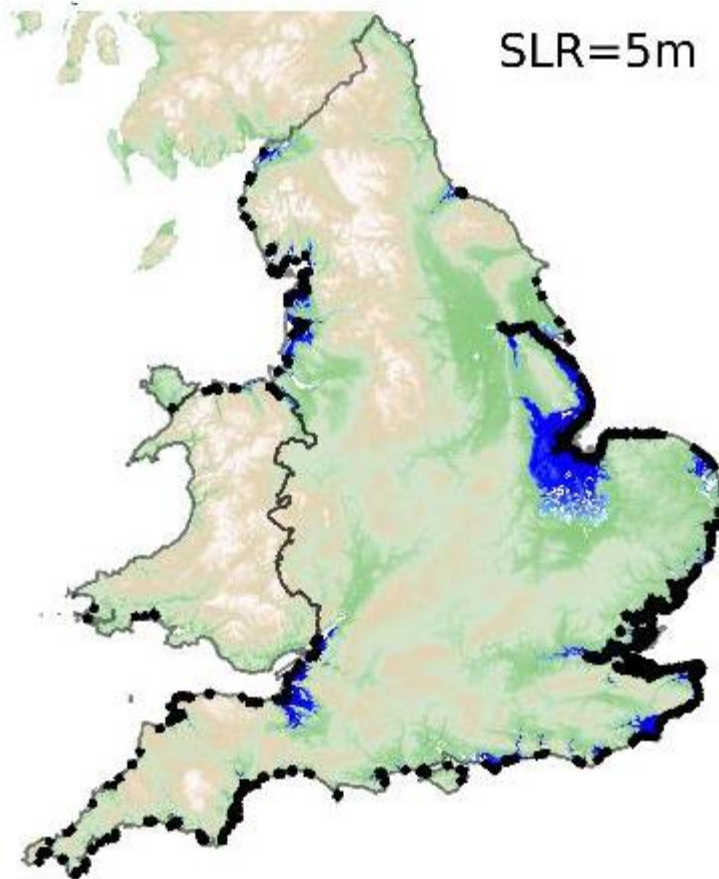
Project D: H++ scenarios

Hazard	'Mainsteam' projection	H++ scenario
Peak river flows	20 to 30% increase in peak river flows depending on region	60 to 120% increase in peak flows (up to +290% physically plausible)
Heavy rainfall	6 to 58% increase in winter rainfall No increase in heavy summer rainfall <i>(Note: from UKCP09, now considered incorrect)</i>	70 to 100% increase in winter rainfall Up to 500% increase in frequency of heavy summer rainfall
Sea level rise	50 to 100cm of sea level rise by 2100	93 to 190cm of sea level rise by 2100

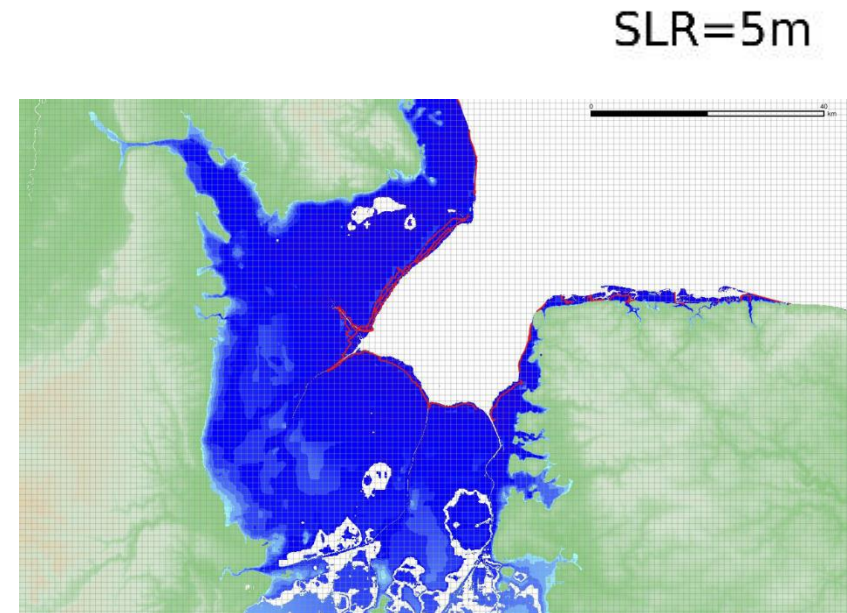
Can't assume current sea defence lines are sustainable. Floodplain likely to grow in extent.

Project A: Future flood risk

Inundation depth in a 1:200 tidal surge: 



Black lines: vulnerable defences

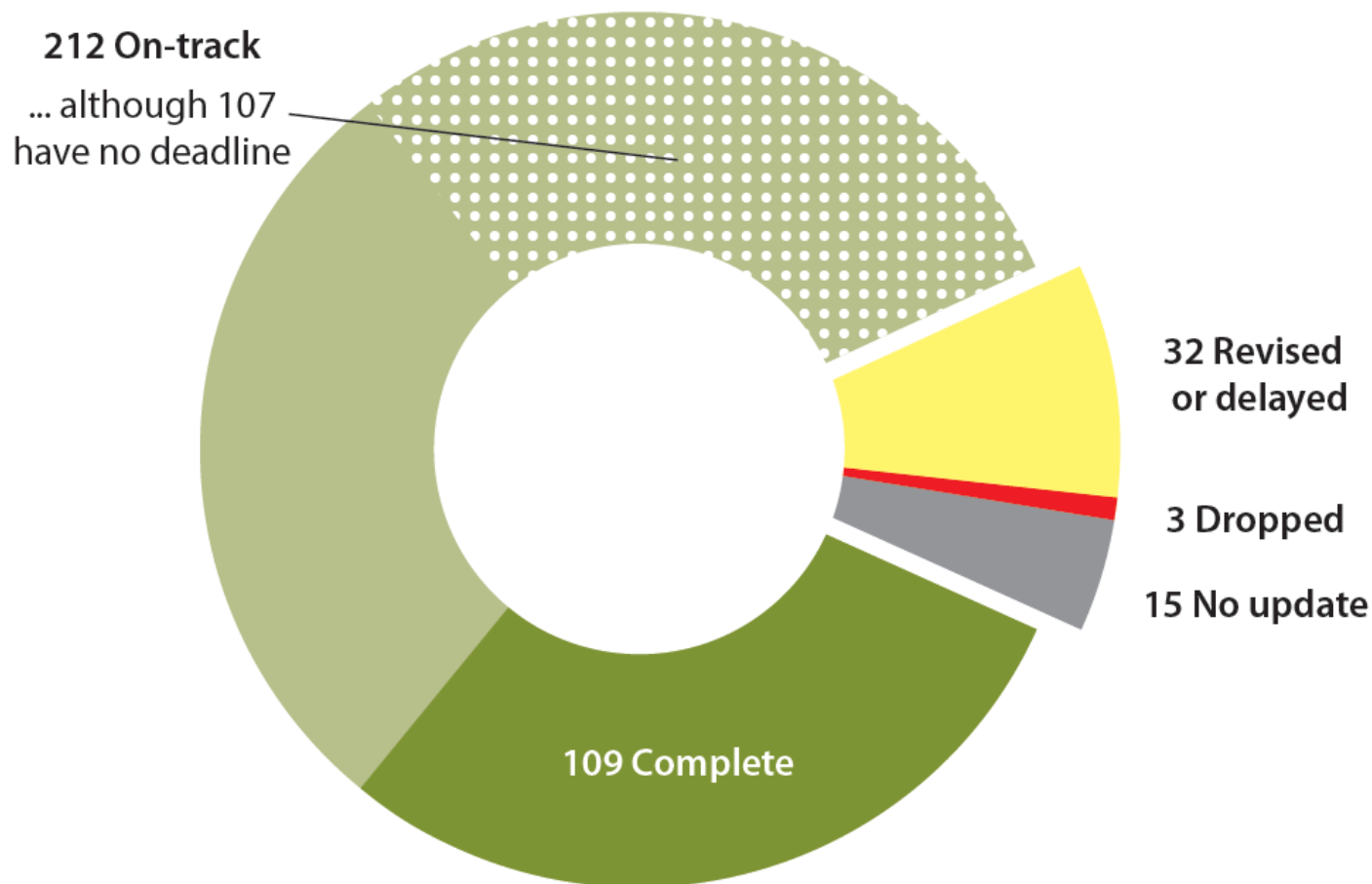


The Wash

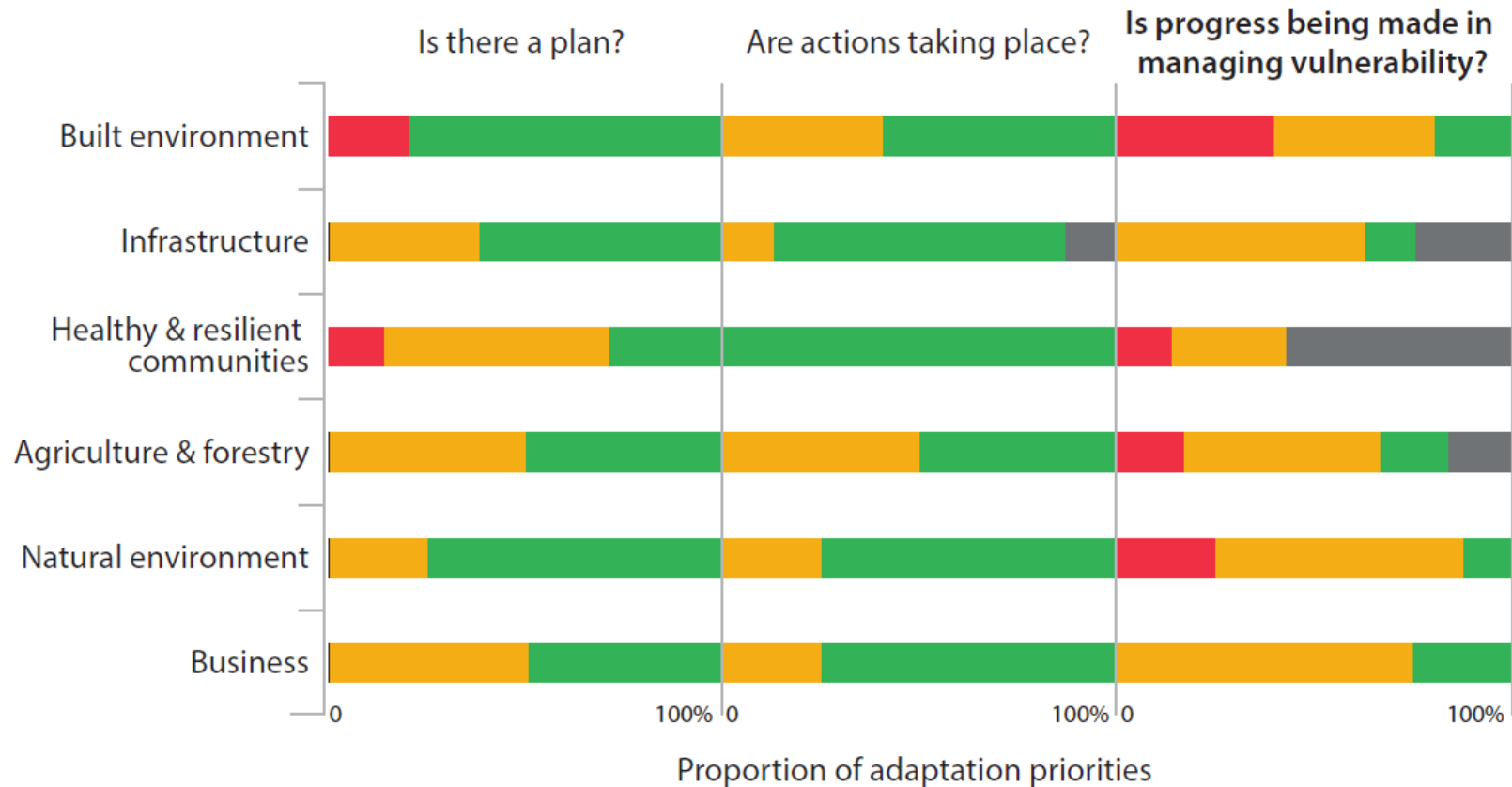
Red lines: vulnerable defences

White areas: below current sea level

Actions in the National Adaptation Programme are being delivered...



...but that doesn't necessarily mean climate change risks are reducing



- Green:** plans are in place, actions are being delivered, progress is being made
- Amber:** adaptation priority has been partially addressed, some evidence of progress in some areas
- Red:** plans and policies, delivery of actions, or progress in addressing vulnerabilities, are lacking
- Grey:** insufficient evidence to form a judgement

In general, more effort is needed to counter four key climate change risks



Adaptation Sub-Committee

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CCRA web: <https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/climate-change-risk-assessment-2017/>



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