

# **The outcomes of the Paris Climate Change conference and the implications for UK adaptation**

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**Committee on Climate Change**

Coastal Futures

20<sup>th</sup> January 2016

## Statutory roles:

- **To provide independent, expert advice** on climate threats and opportunities (advisory role)
- **To report to Parliament on progress** towards adaptation (scrutiny role)



Prof Lord John  
Krebs (chair)

Ece  
Ozdemiroglu



Prof Jim Hall

Prof Dame  
Anne Johnson



Rosalyn  
Schofield

Sir Graham  
Wynne



# THE PARIS AGREEMENT

1.5 DEGREES

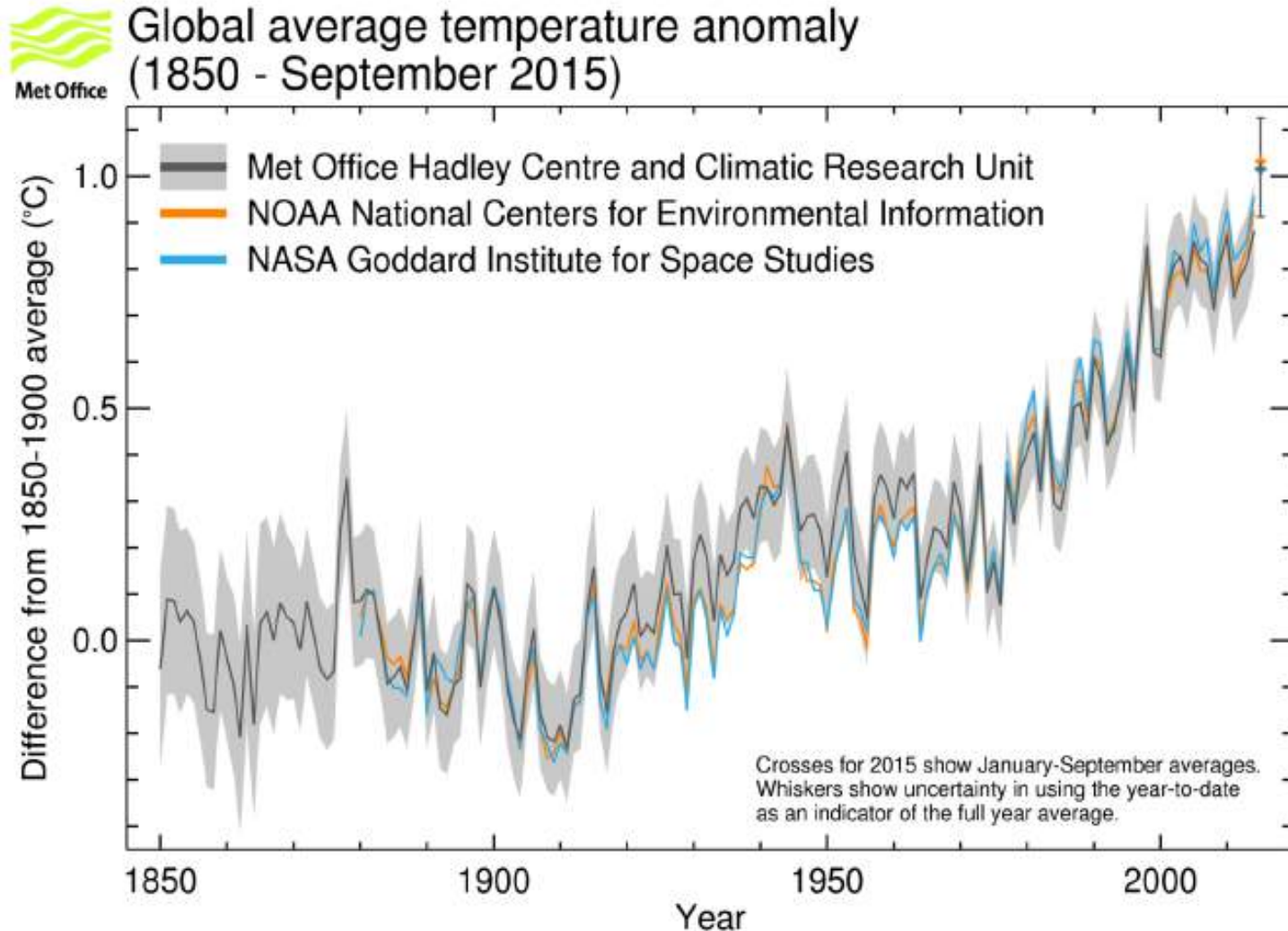


# After 21 years of negotiation, a legally-binding, global deal to avoid dangerous climate change



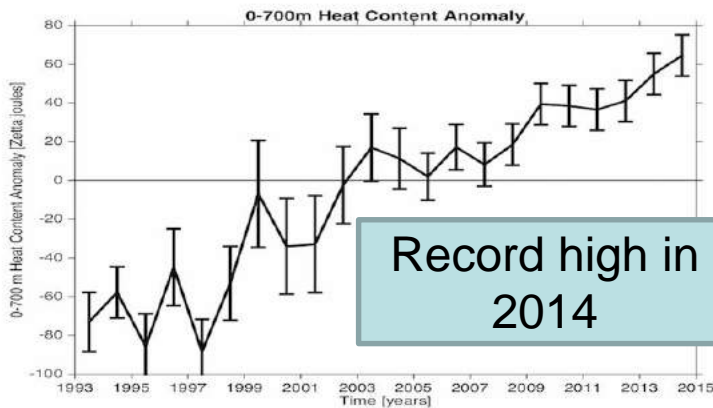
- **A global deal**
  - Agreed by 195 countries (Kyoto Protocol: 37)
- **New long-term goals**
  - To achieve “well below 2°C”, and “pursue efforts” to achieve 1.5°C
  - Recognition that emissions need to peak soon and then reduce quickly to net zero in the second half of the century
- **Five-year review and ratchet process**
  - Legal obligation to produce new Nationally Determined Contributions every five years, which must step up in ambition over time
  - A “global stocktake” every five years, the first in 2023
  - 2018 the first milestone, with an updated IPCC report focusing on the science and economics of achieving 1.5°C
- **Measurement and verification**
  - Standardised reporting of emissions and tracking of progress
- **Climate change finance**
  - US\$ 100 billion per year by 2020

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

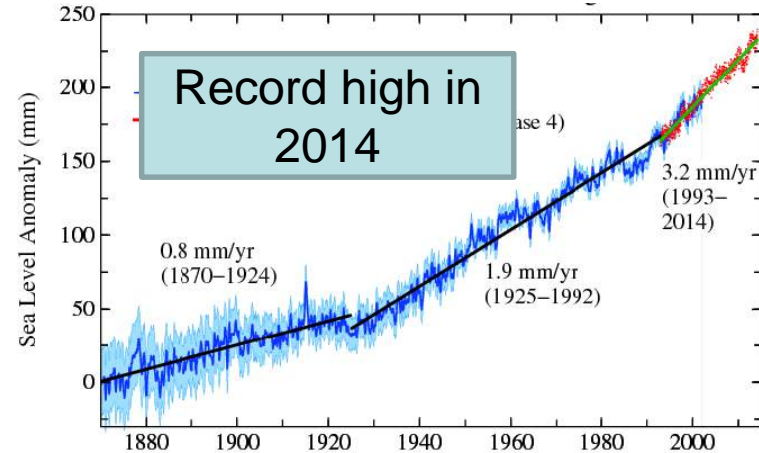


# Global indicators of climate change

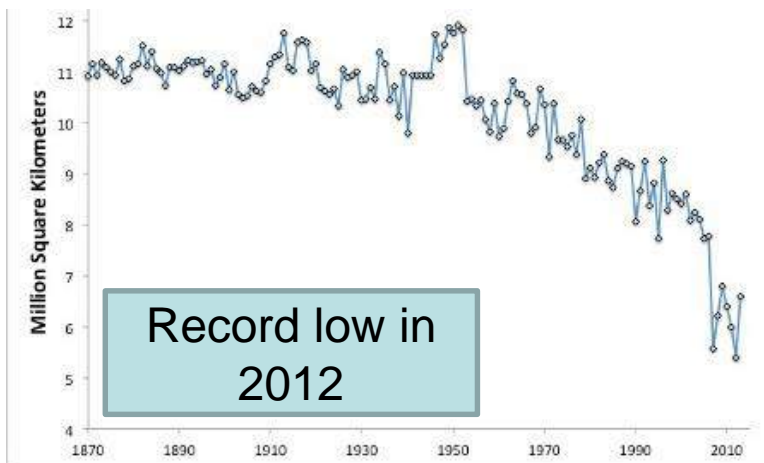
## Upper ocean heat content



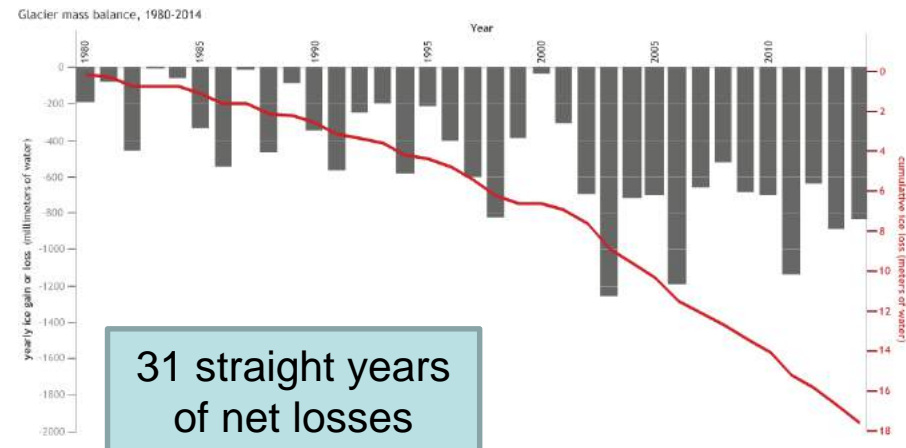
## Global average sea level



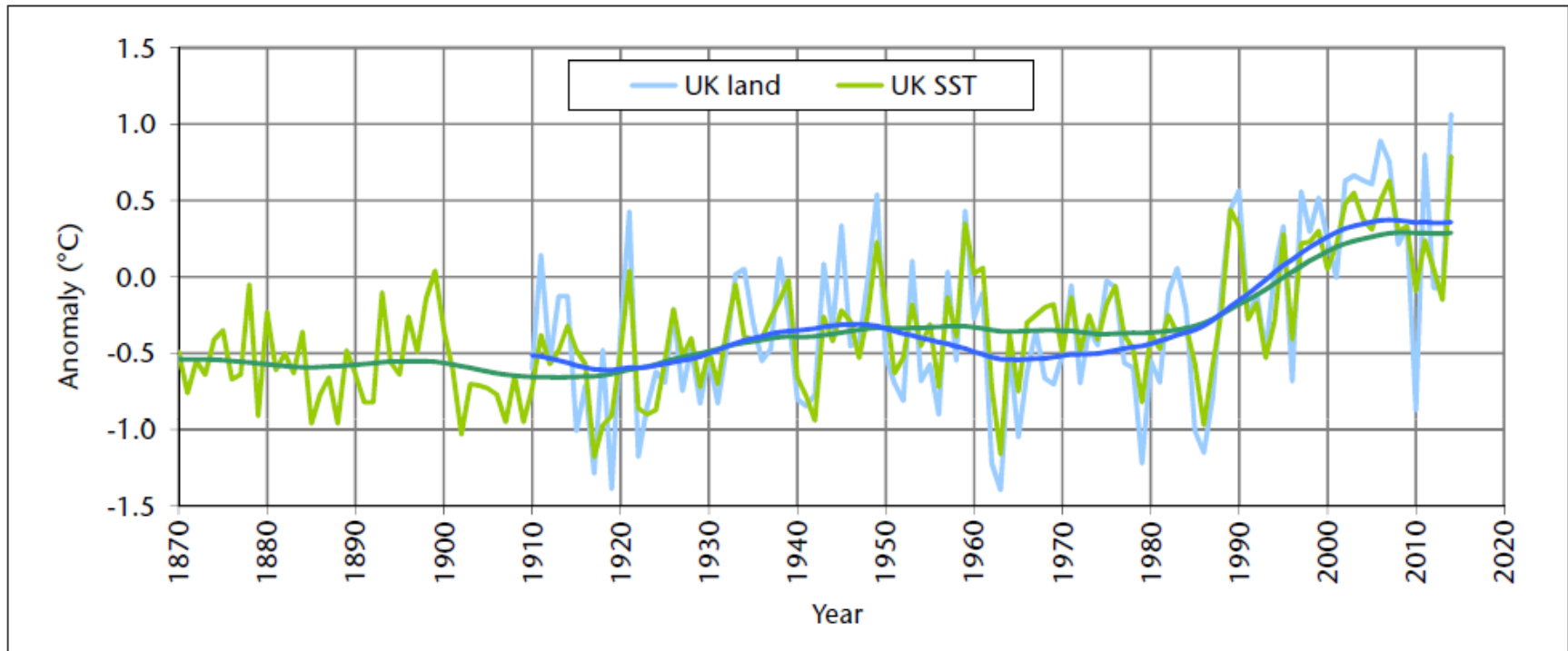
## Summer arctic sea ice extent



## Glacier mass loss

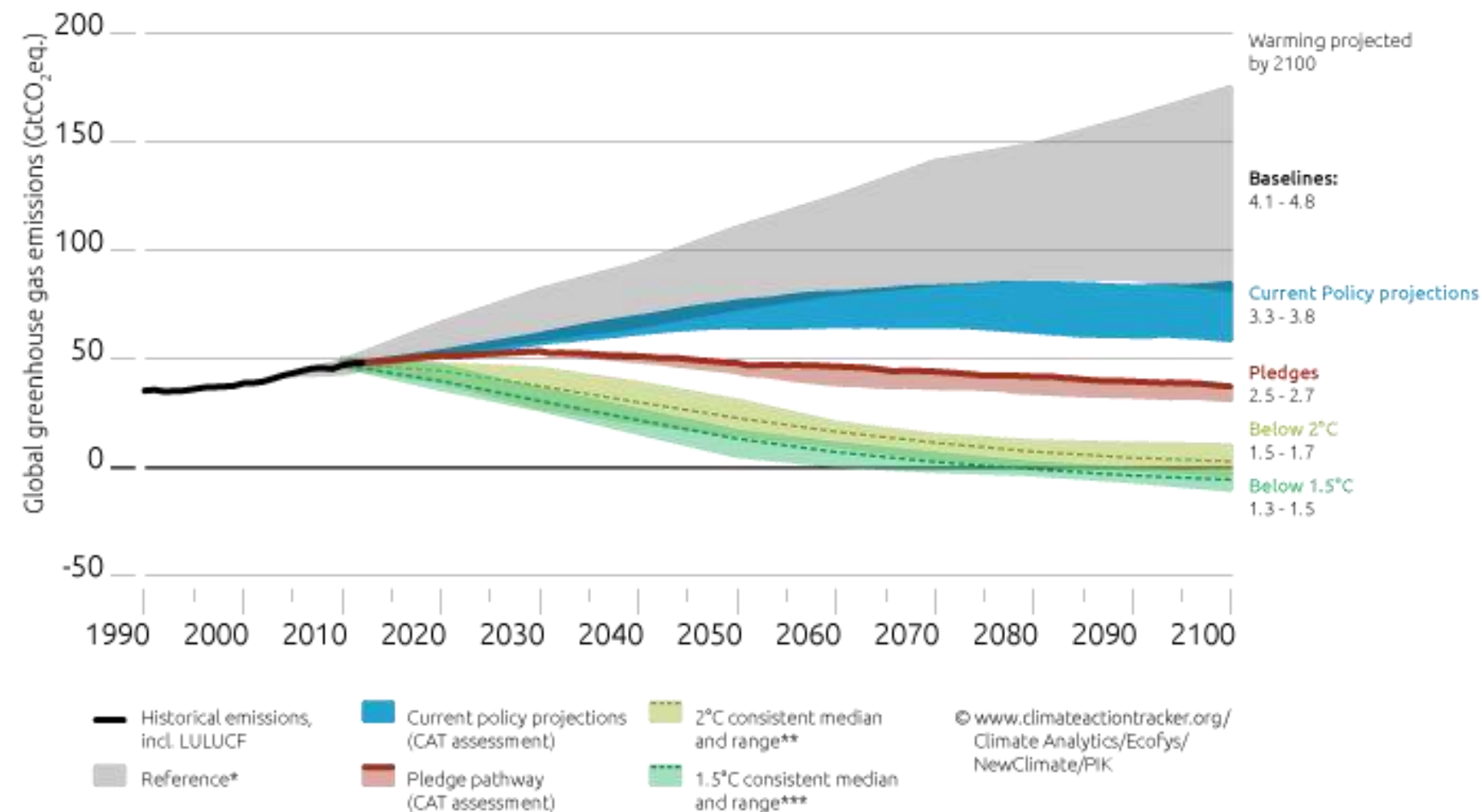


# UK land and sea surface temperatures have warmed by $\sim 1^{\circ}\text{C}$ , record highs for both in 2014



Variable	1961-1990 average	1981-2010 average	2005-2014 average	Year 2014
UK land	8.3	8.8	9.2	9.9
UK near-coast sst	11.1	11.5	11.7	12.2

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



**“The role of human influence on our climate is already detectable on summertime heatwaves and on the character of rainfall” *Met Office Hadley Centre***



**Too HOT**

Chance of European summer heatwave like in 2003  
very likely doubled by historic emissions

**Too WET**

Autumn 2000 floods made more likely  
by historic emissions, perhaps twice or  
more as likely

Extremely wet winters like 2013/14  
25% more likely

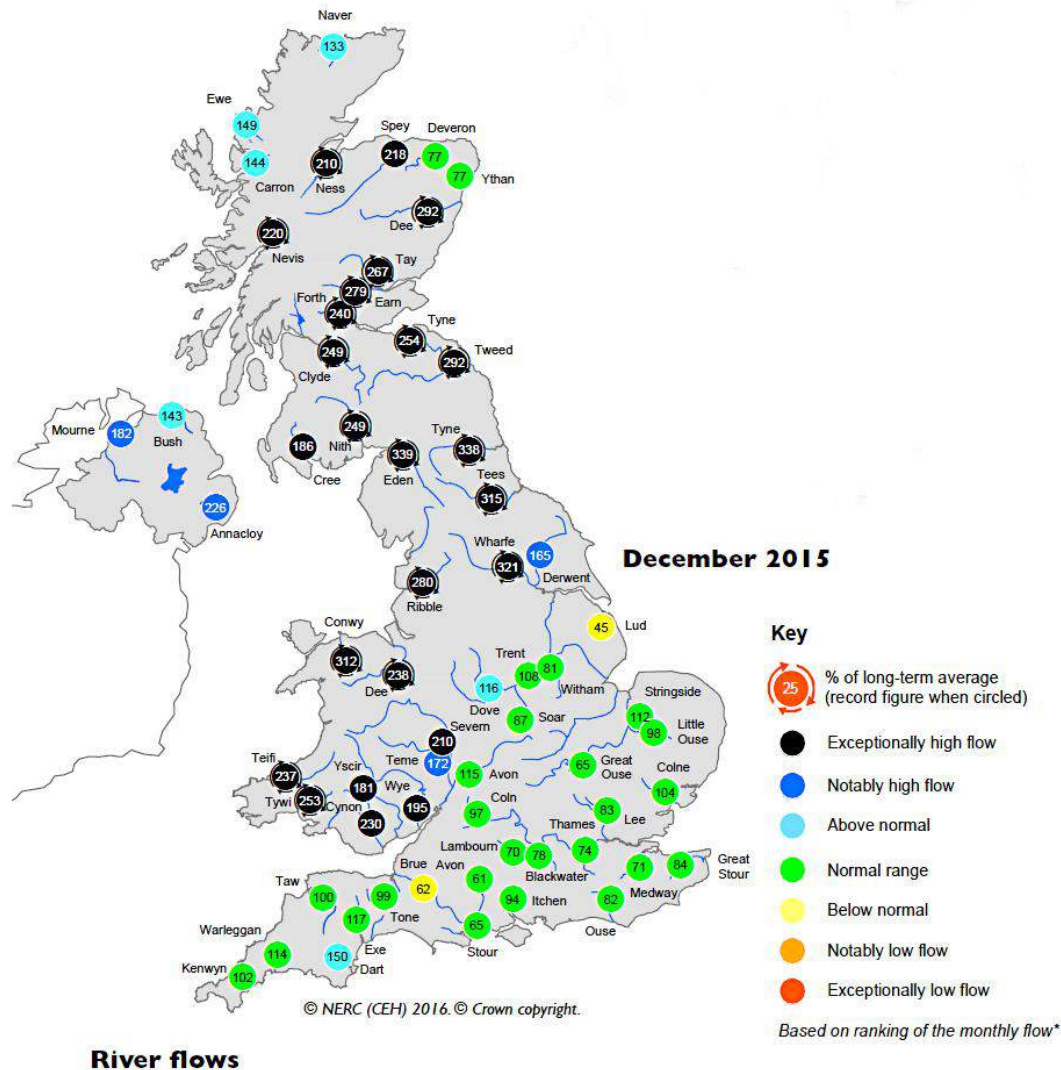
**Too DRY**

Chance of drought in Texas like 2011 in  
La Nina years has increased by a factor  
of twenty

**Too COLD**

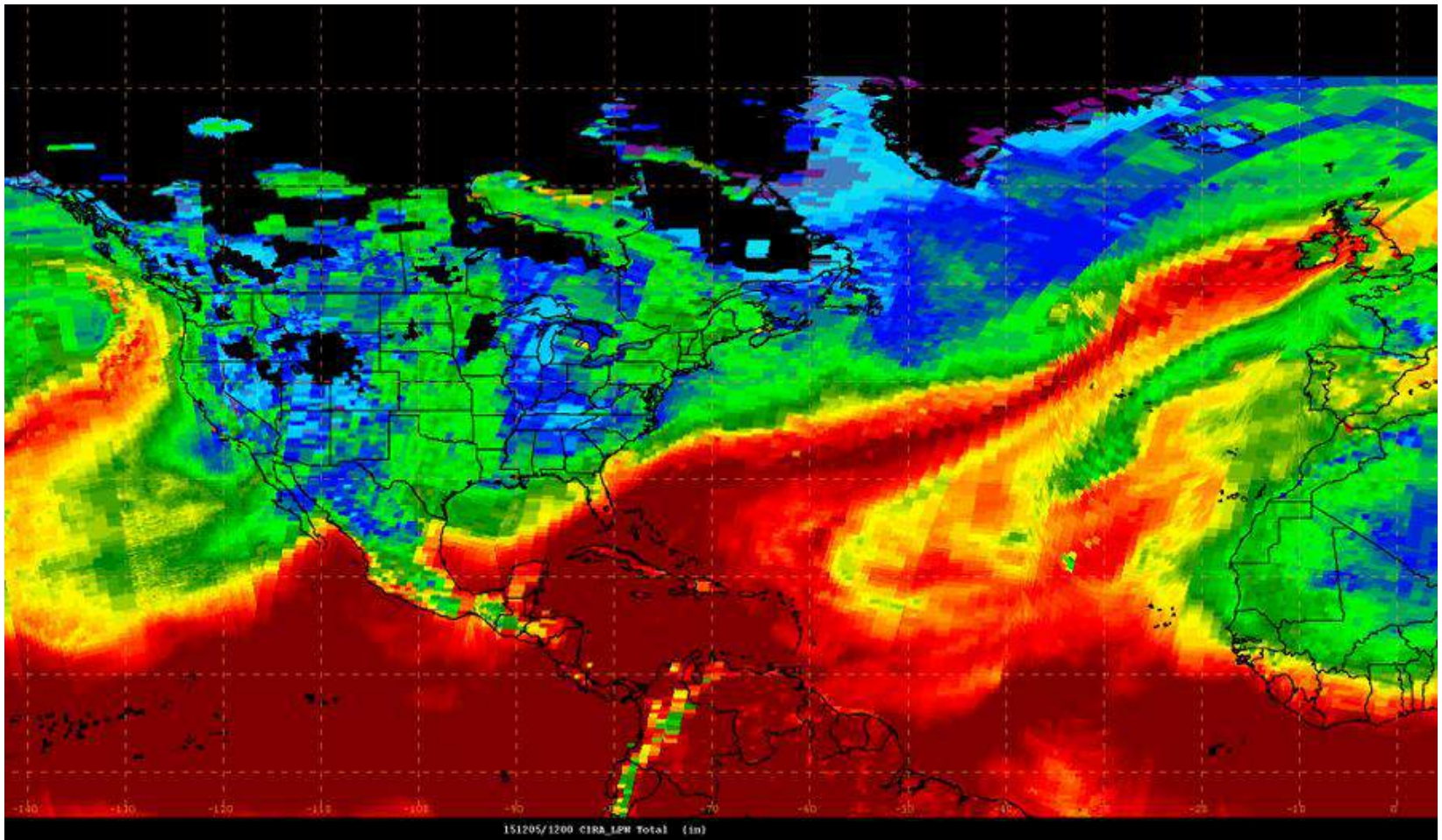
Cold December temperatures now half  
as likely than in 1960s but cold winters  
can still be expected

# December 2015 was the wettest calendar month on record with many rainfall and river flow records broken



- New 24-hour rainfall record for UK (341.4mm, Honister Pass)
- New 48-hour rainfall record for UK (405.0mm, Thirlmere)
- Wettest calendar month on record for UK (191% of December average) in a series from 1910
- Largest ever flows recorded on English rivers (~1700 cumecs (cubic metres per sec) Eden, Lune and Tyne)
- Warmest December in a series from 1910 (4.1°C above average)

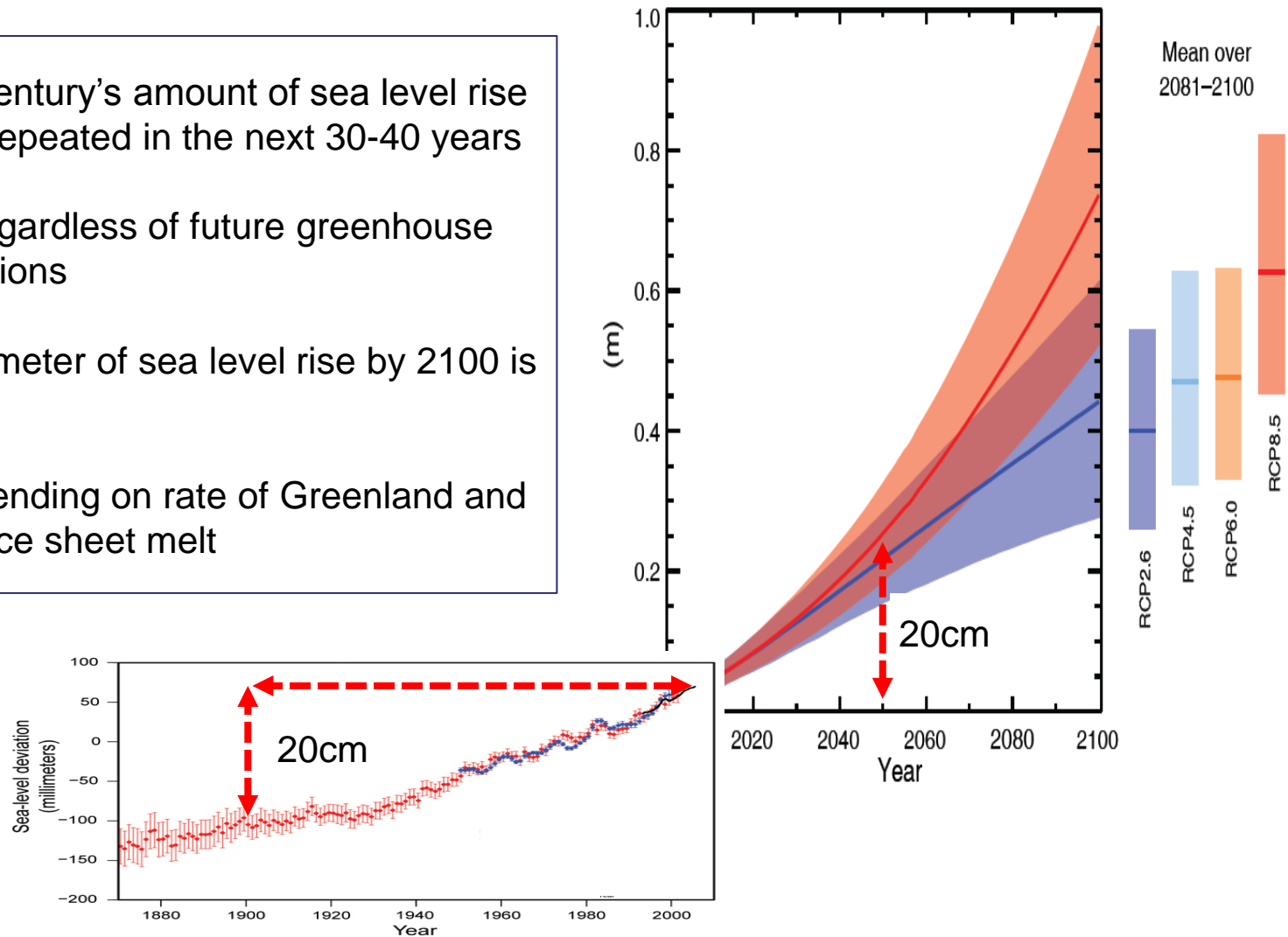
# Atmospheric rivers expected to become more common with climate change and be able to hold more moisture



Layered precipitable water imagery the atmospheric river stretching from the Caribbean to the United Kingdom on 5 December 2015, coinciding with Storm Desmond

# Lag in the Earth's climate system means the majority of impacts from historic warming 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 plausible
- More depending on rate of Greenland and Antarctic ice sheet melt



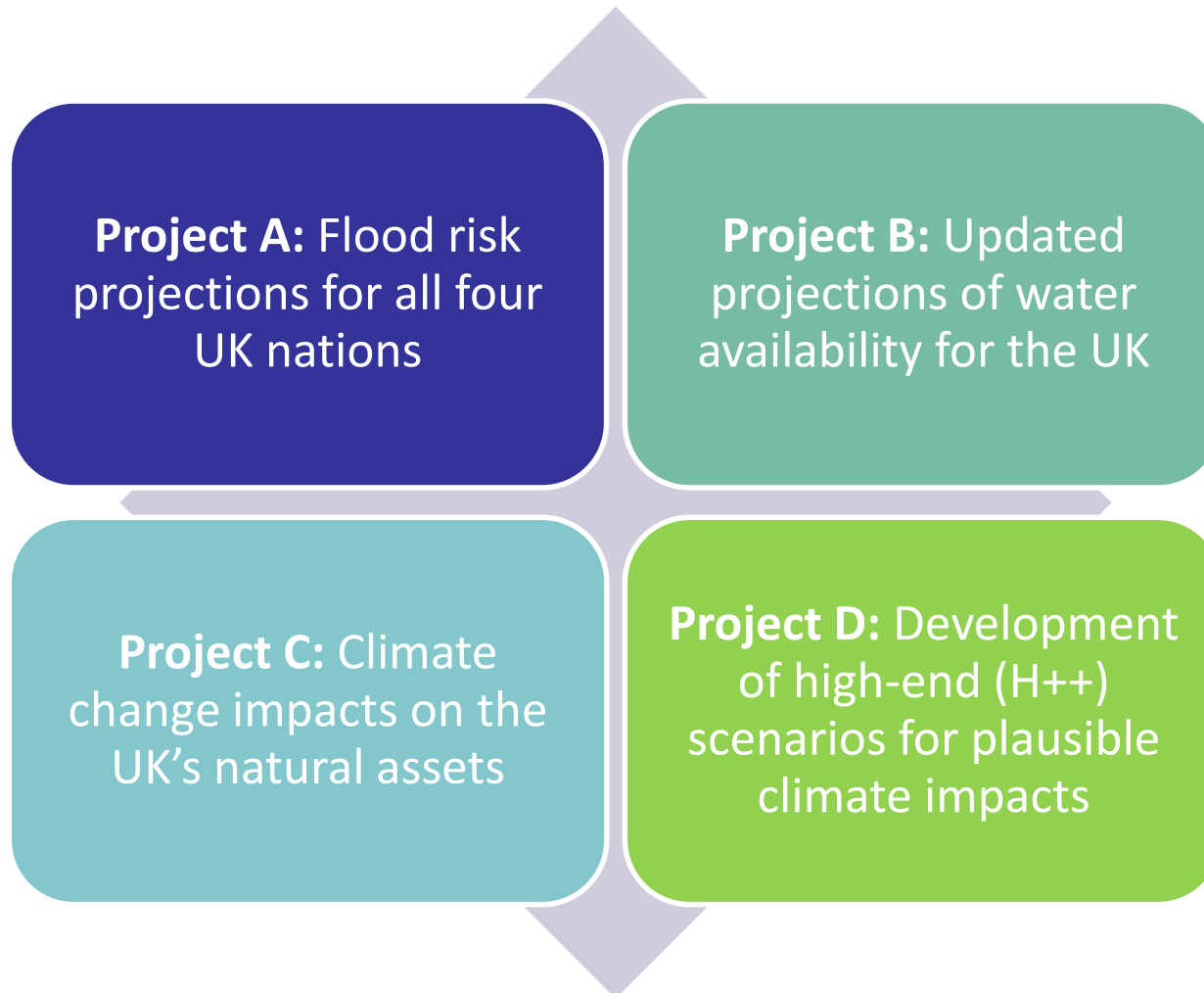


# **UK CLIMATE CHANGE RISK ASSESSMENT 2017**

## ‘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?”

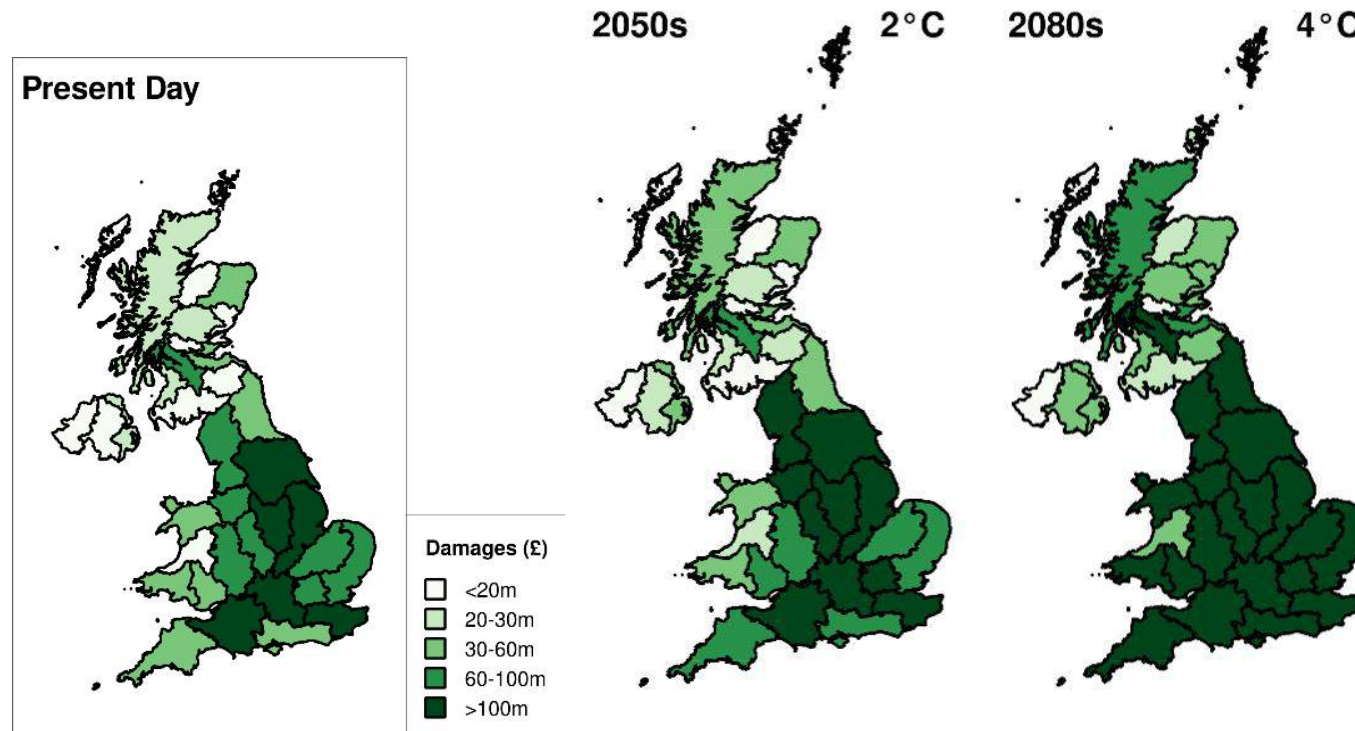
## CCRA studies: four NERC-funded research projects



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

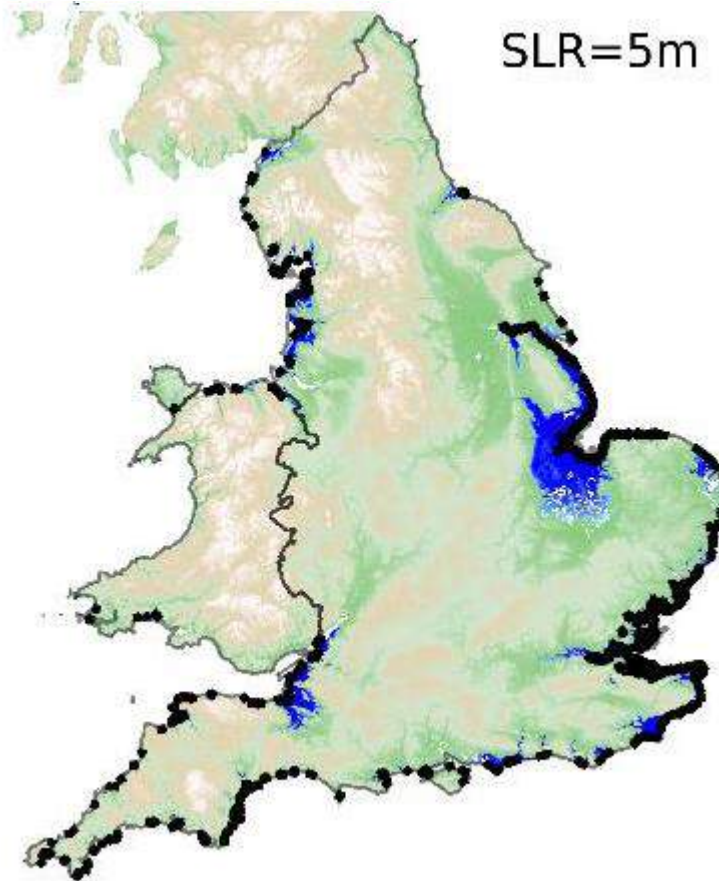
## Project D: H++ scenarios

Hazard	'Mainsteam' projection	H++ scenario
<b>Peak river flows</b>	20 to 30% increase in peak river flows depending on region	60 to 120% increase in peak flows (up to +290% physically plausible)
<b>Heavy rainfall</b>	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
<b>Sea level rise</b>	50 to 100cm of sea level rise by 2100	93 to 190cm of sea level rise by 2100

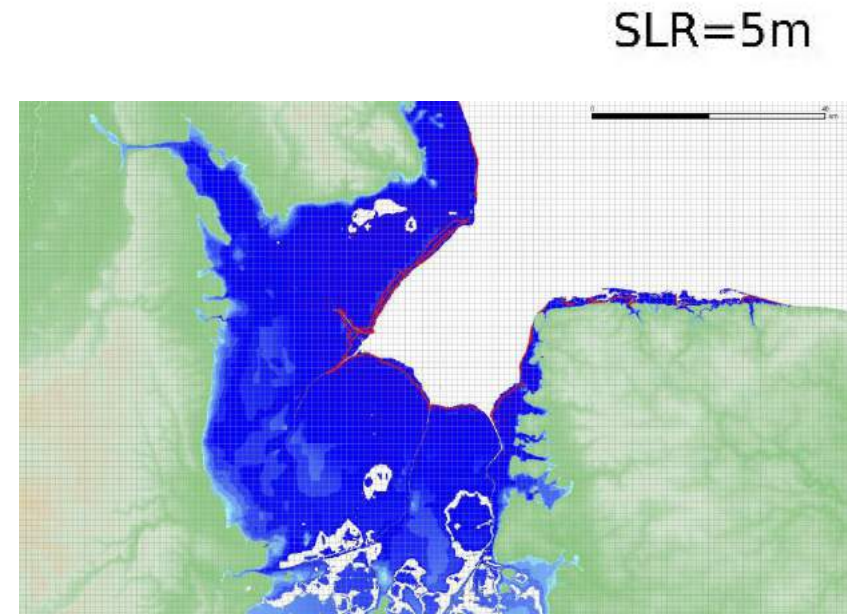
Can't assume current sea defence lines are sustainable. Floodplain likely to grow in extent.

## Project A: Future flood risk

Inundation depth in a 1:200 tidal surge: 0 meters  
5 meters



*Black lines:* vulnerable defences



### The Wash

*Red lines:* vulnerable defences

*White areas:* below current sea level



- Paris Agreement is a **massive step-forward** but will need to be followed by decisive action by national governments
- **Can expect progress in reducing emissions to accelerate** as technology costs fall and investment steps up
- But UK should still prepare for **increasing climate impacts**:
  - Investment in **flood and coastal defence** assets will need to steadily increase, plus more effort to improve the management of catchments, the coast, and urban areas to alleviate flooding.
  - Some progress in managing the risk of **water scarcity** but further strategic investment by water companies, and reform of the water licencing system, needed.
  - Need to begin to adapt the built environment so that homes and other buildings can be comfortable and safe in **higher temperatures**. Declines in urban greenspace need to be reversed.
  - Without further action to conserve soils and restore habitats, farmers may not benefit from the **opportunities of longer growing seasons**, and the **natural environment** will be severely harmed by climate change.

## Adaptation Sub-Committee

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