



Assessing future flood risk and opportunities for adaptation at UK scale

Paul Sayers

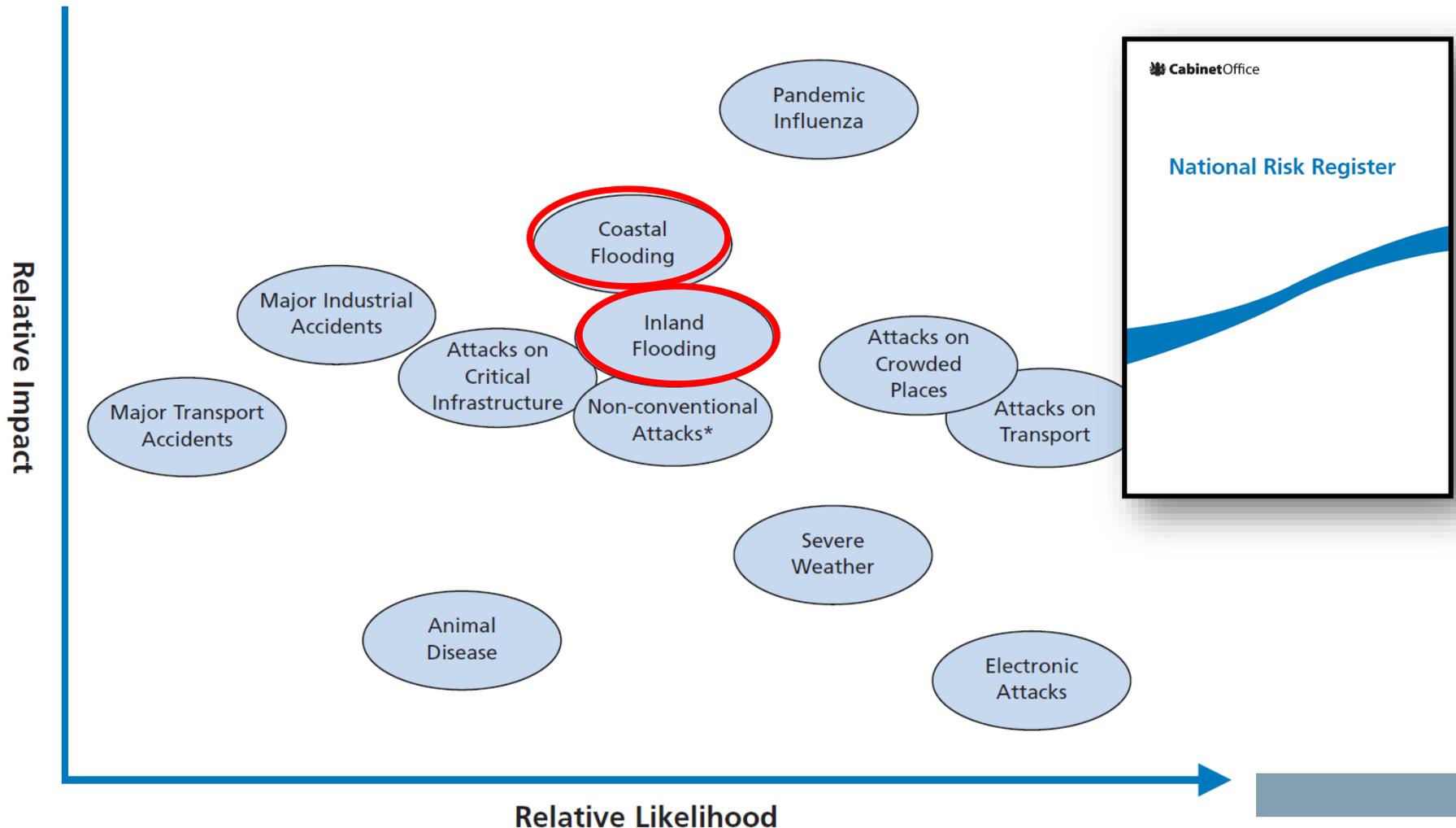
Sayers and Partners (SPL), Associate Advisor WWF and Research Fellow, University of Oxford.

Co-authors Matt Horritt, Edmund Penning-Rowell and Andrew McKenzie

Motivation and context

Why assess risk at **national scale**?

- Flooding is a 'high consequence' threat to the UK



Motivation and context

Why assess risk at **national scale**?

- **Flooding is a ‘high consequence’ threat to the UK**
- **National flood risk assessments are used to:**
 - Inform policy priorities
 - Inform the scale of investment in flood risk management (when compared to other demands on the national purse)

Why assess **future risks**?

- A Golden Rule of **Strategic flood risk management**
- The **UK Climate Change Act 2008** requires a **Climate Change Risk Assessment** (the CCRA) every 5 years and the production of a **policy programme** to address those risks
 - *The evidence provided to the CCRA on future flood risk is the subject this talk*

Approach

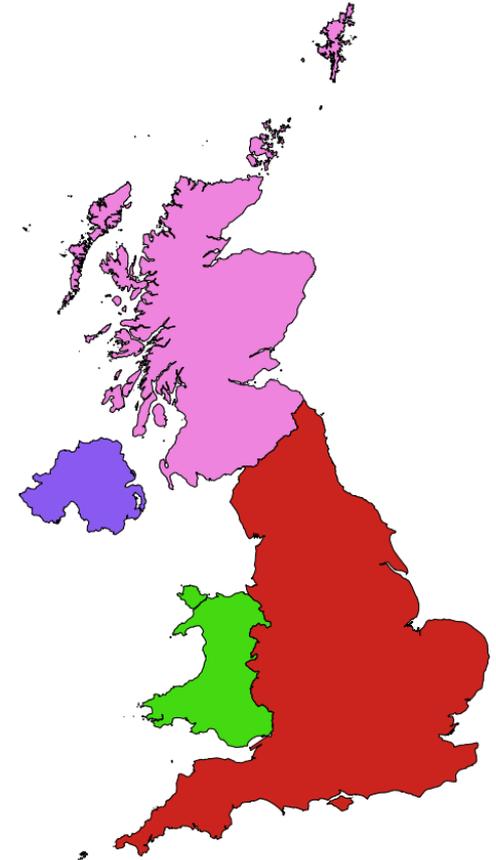
To assessing future flood risk in UK in the 2020s, 2050s, 2080s

Assuming

2°, 4° and H⁺⁺ climate futures

Low and high population projections

Six alternative adaptation scenarios



Approach: All sources of flood hazard



Fluvial
Tewksbury, UK July 2007



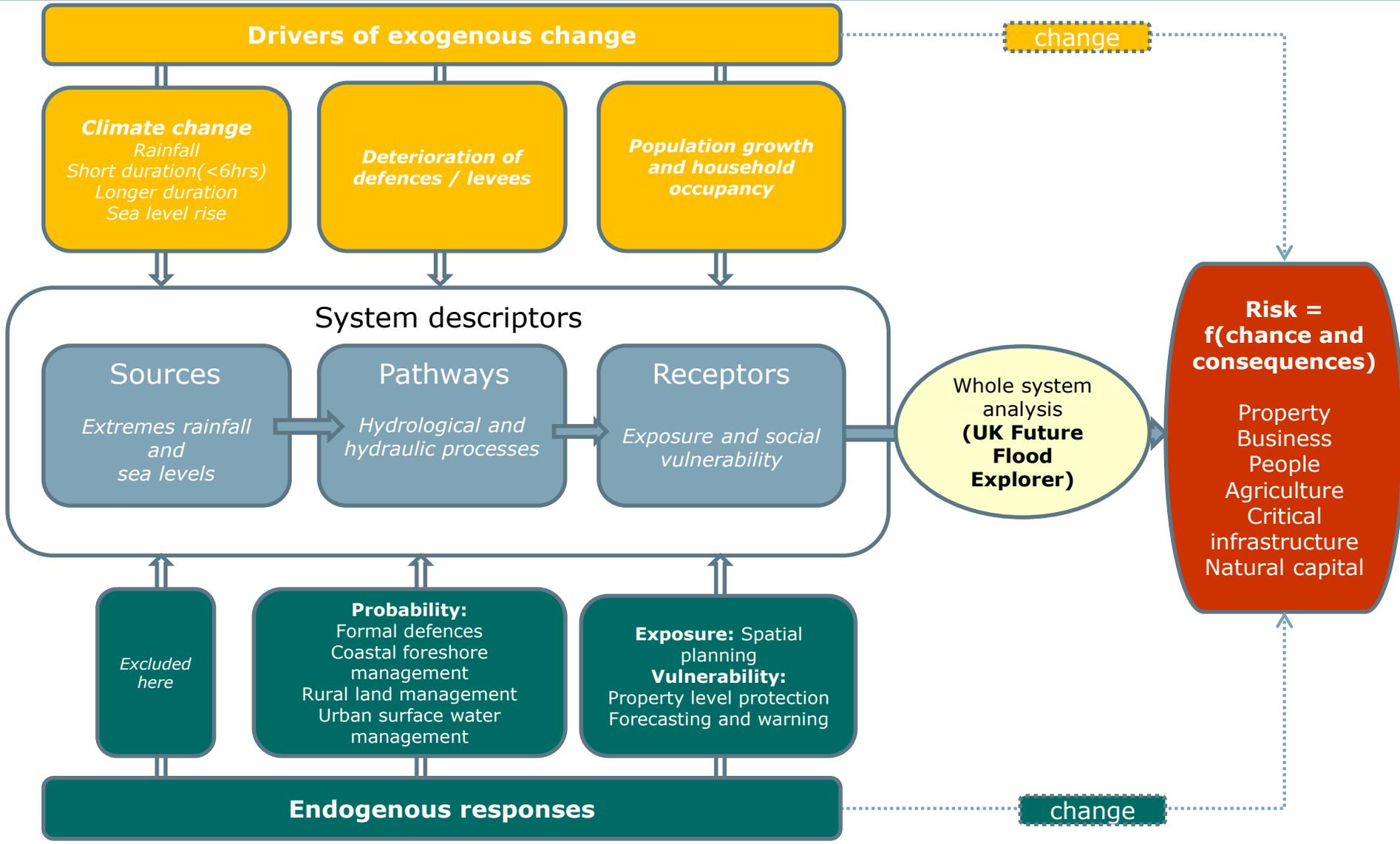
Coastal
West Bay, Dorset, October 2004
Taken by: *West Dorset District Council*



Groundwater
Berkshire, March 2014
Taken by: A McKenzie
Permeable Superficial Deposits
Clearwater (Chalk and other aquifers)

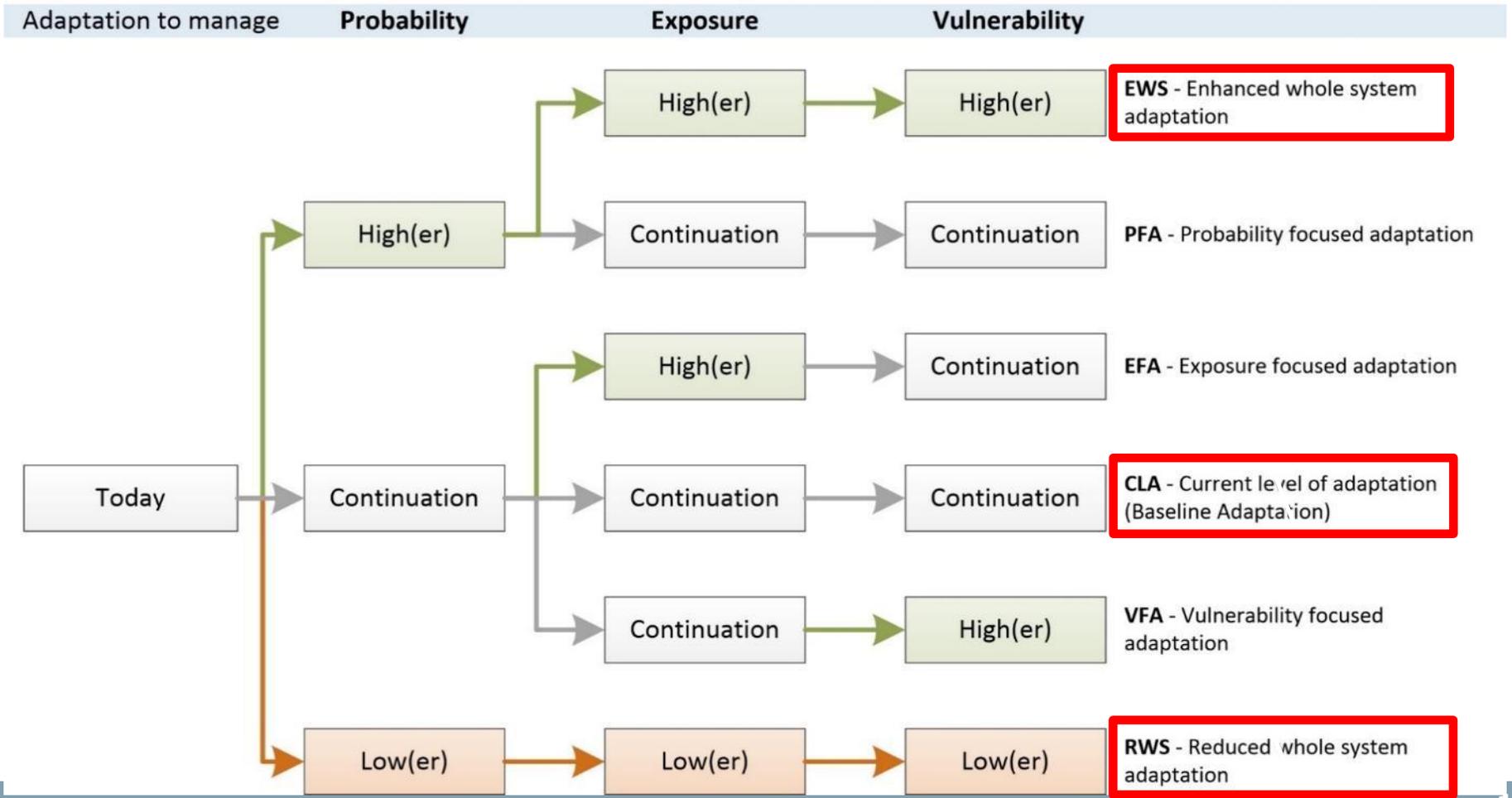


Surface water
Bristol road, Birmingham, 2000
Taken by: John Blanksby



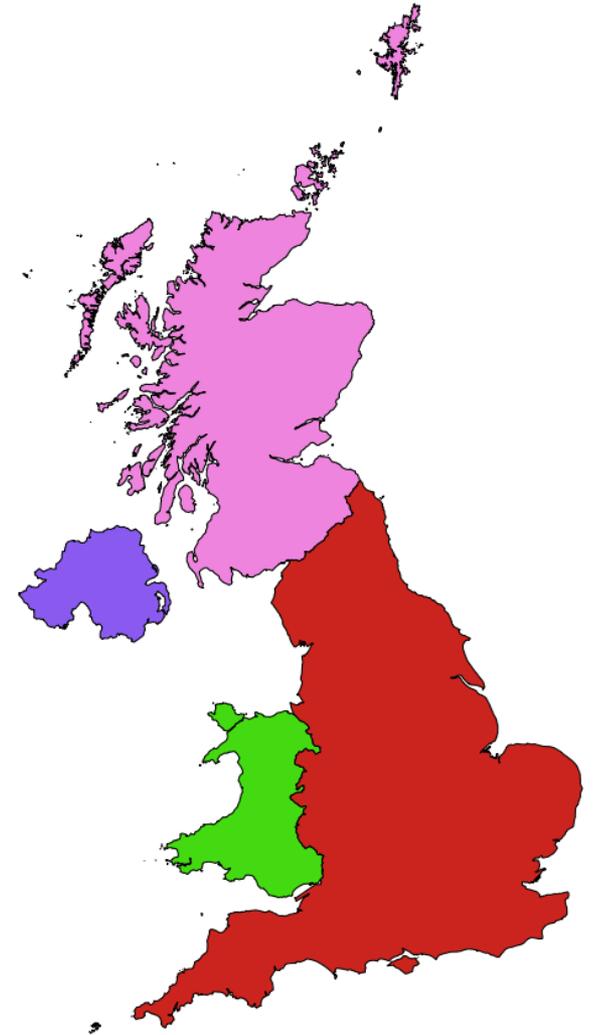
Development alternative adaptation scenarios

- Six alternatives based on a portfolio of measures implemented with a greater or lesser level of ambition



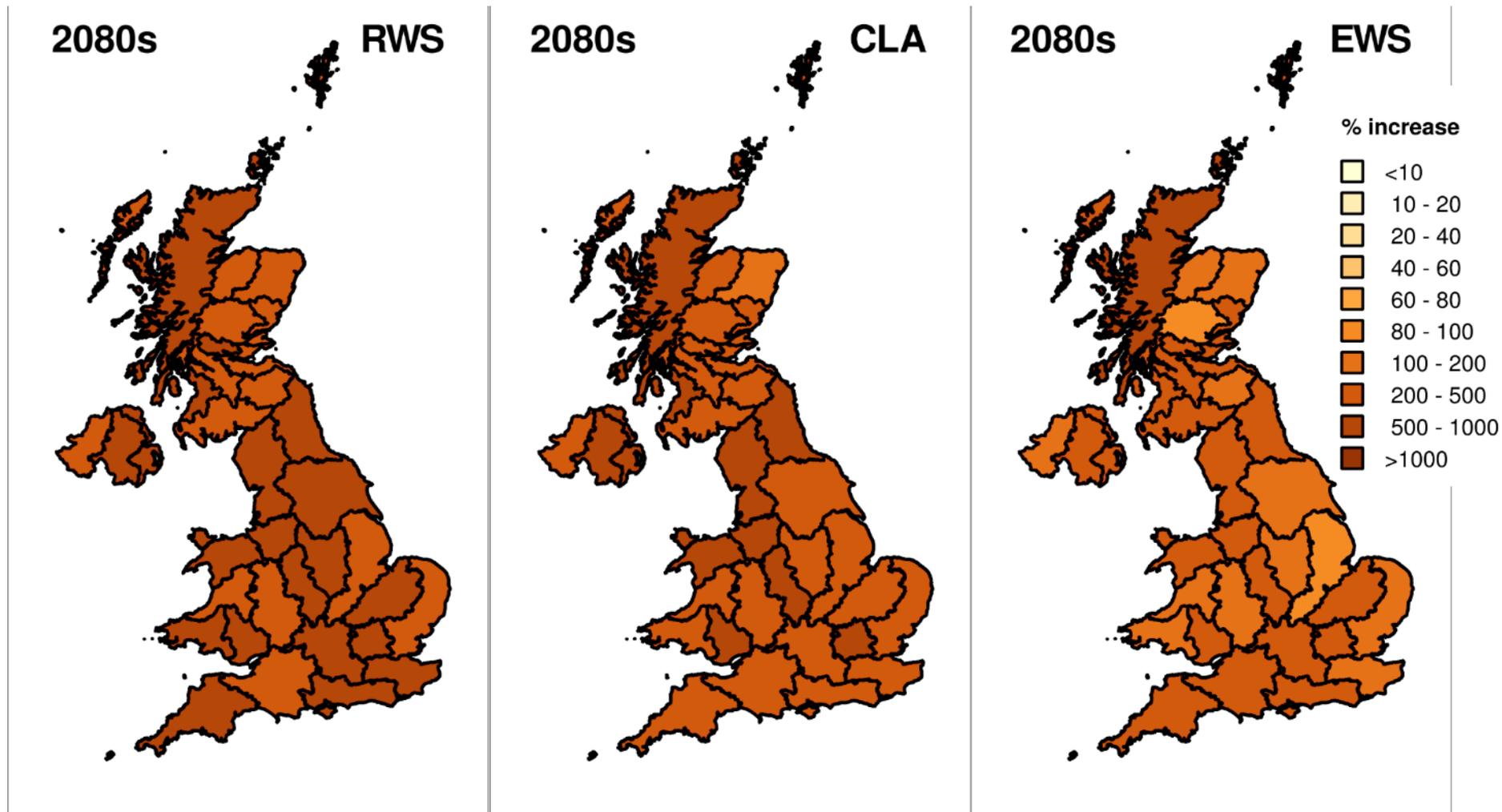
Results

So how do risks change and what impact does alternative levels of adaptation have?



Example results: Change in EAD (£)

HPE Future: Low growth



Example results: EAD (£) through time

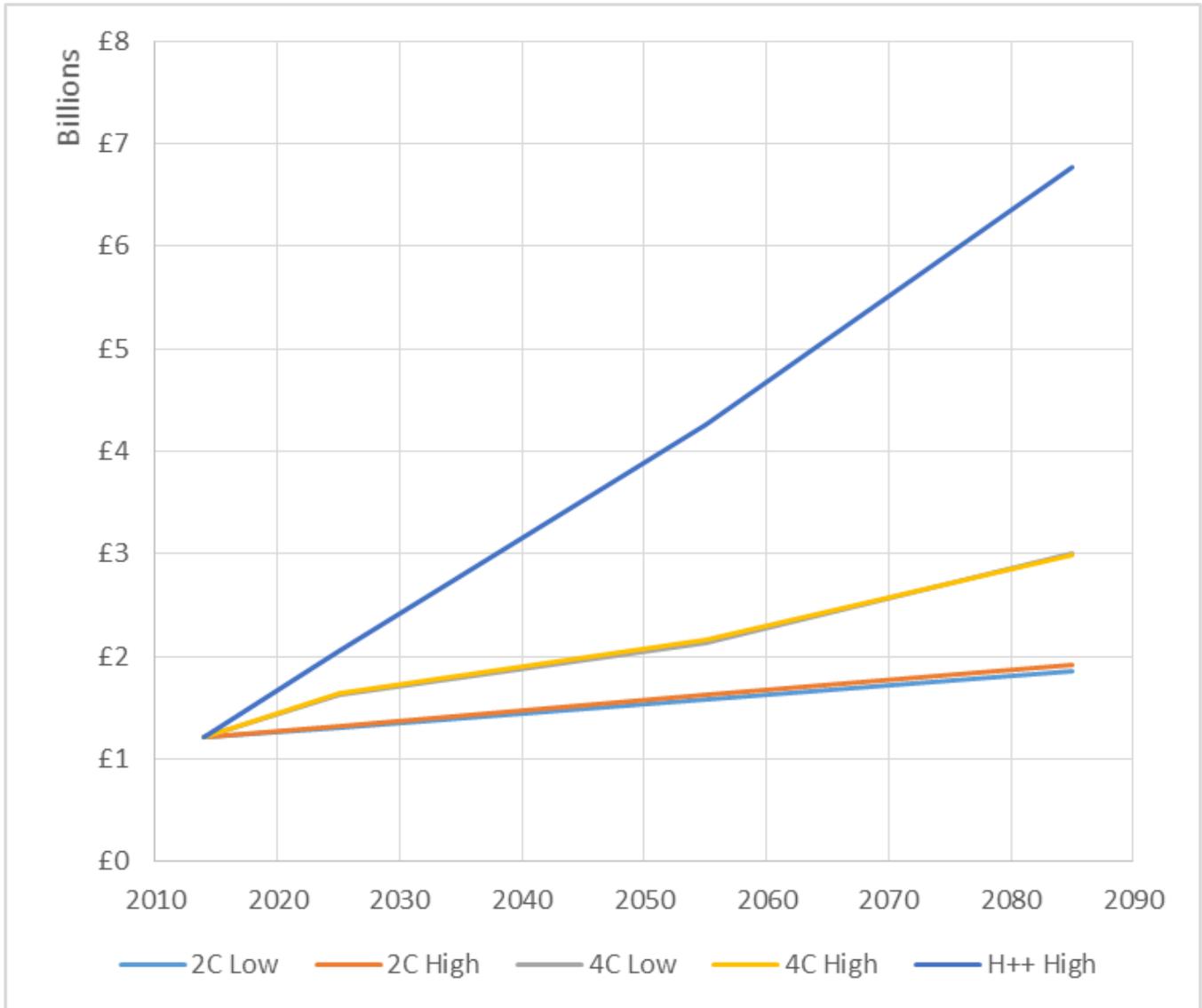
Expected Annual (direct) Damages (EAD)

The UK through time

Assuming

CLA -

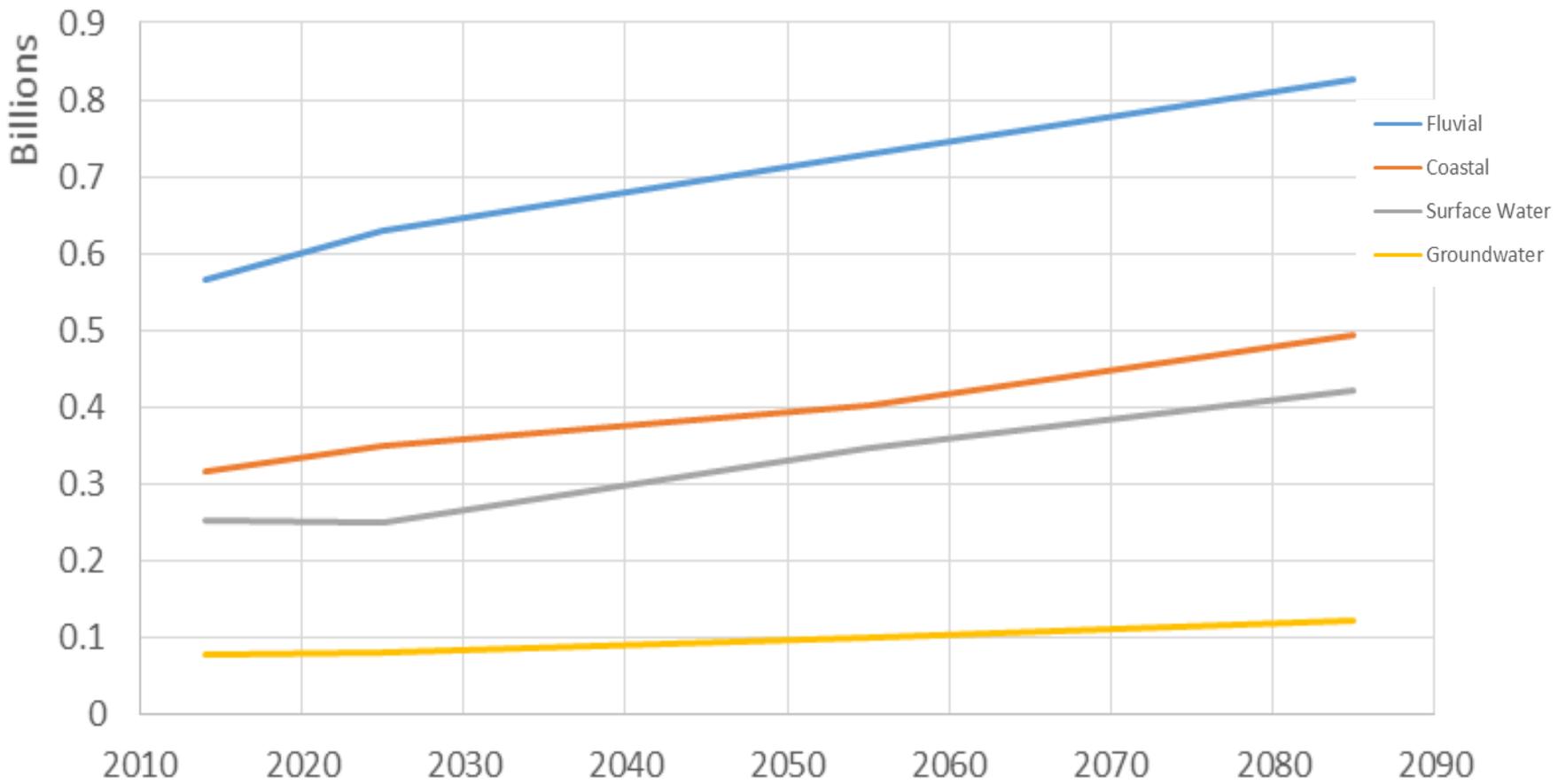
Continuation of current levels of adaptation



Some example: EAD by source

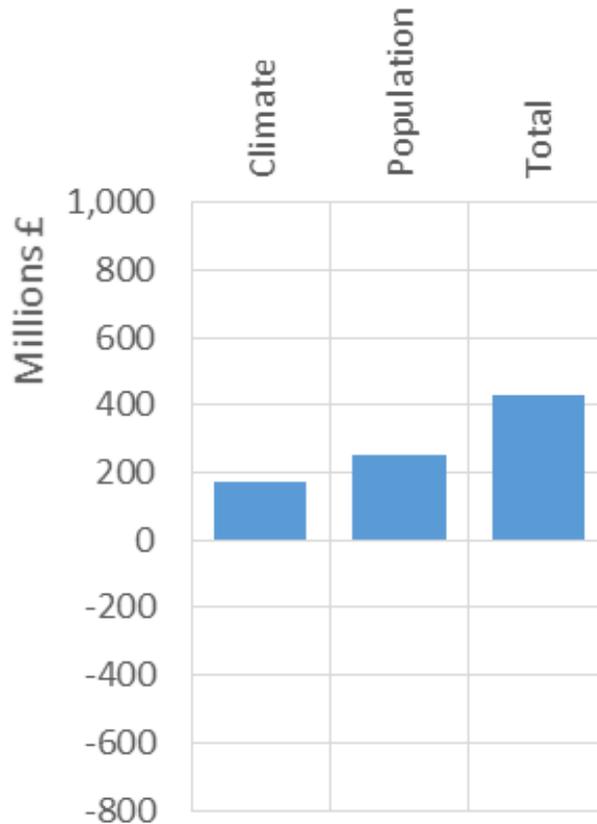
Expected Annual (direct) Damages (EAD)

The UK through time **By flood Source (2° climate future - CLA)**



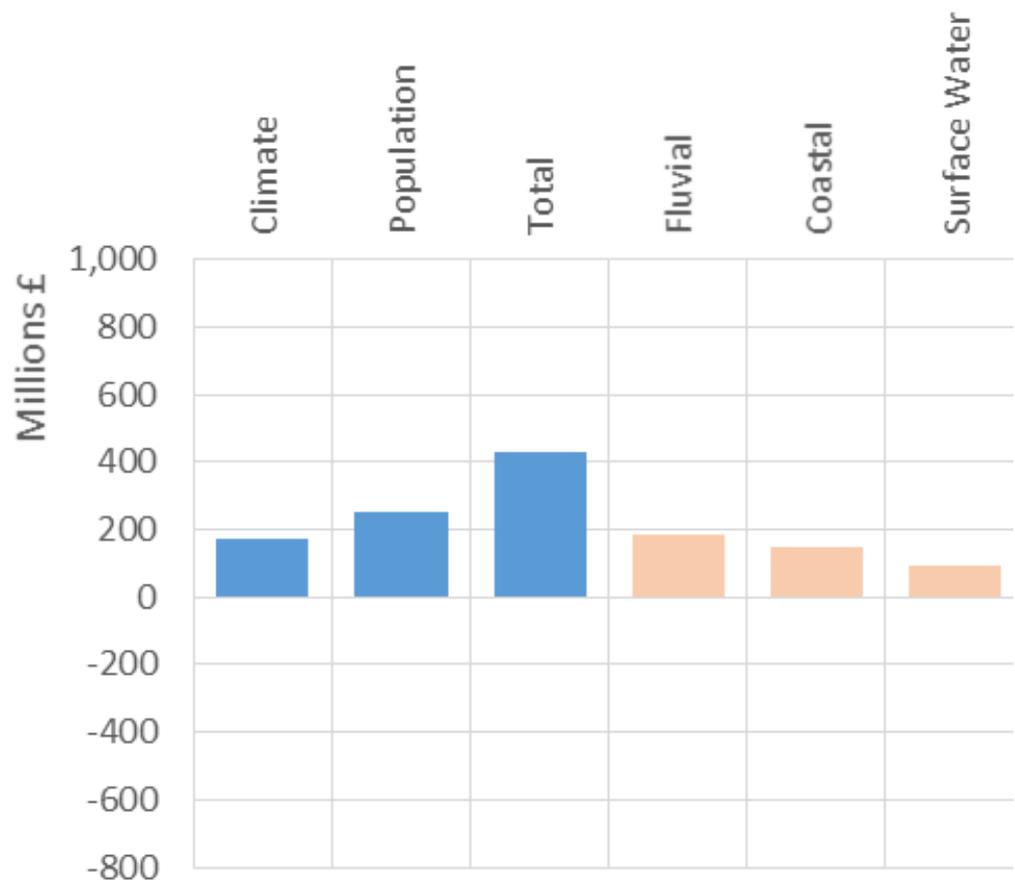
Example results

Drivers of increased risk and ability for adaptation to reduce risk (2°C high population growth, 2050s)



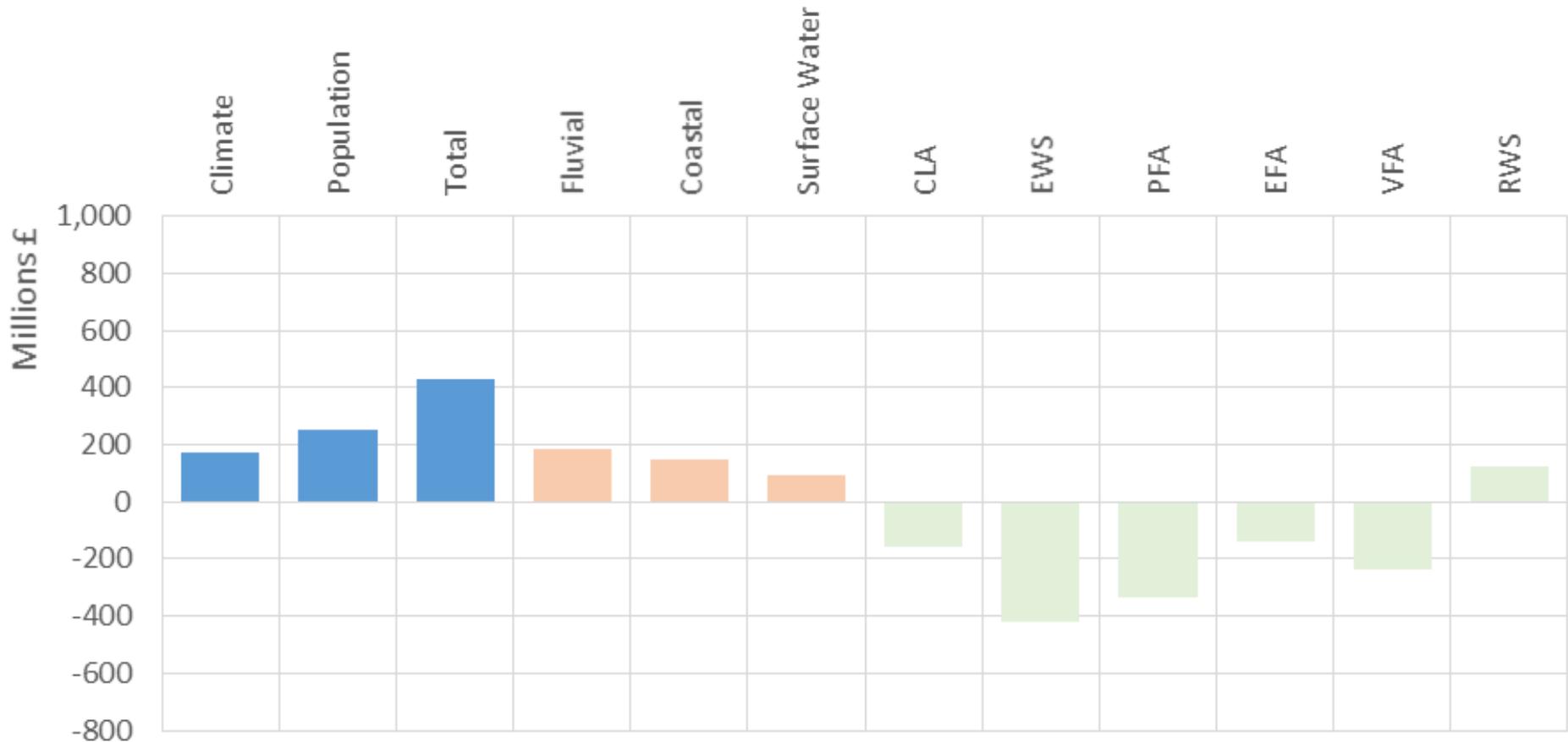
Example results

Drivers of increased risk and ability for adaptation to reduce risk (2°C high population growth, 2050s)



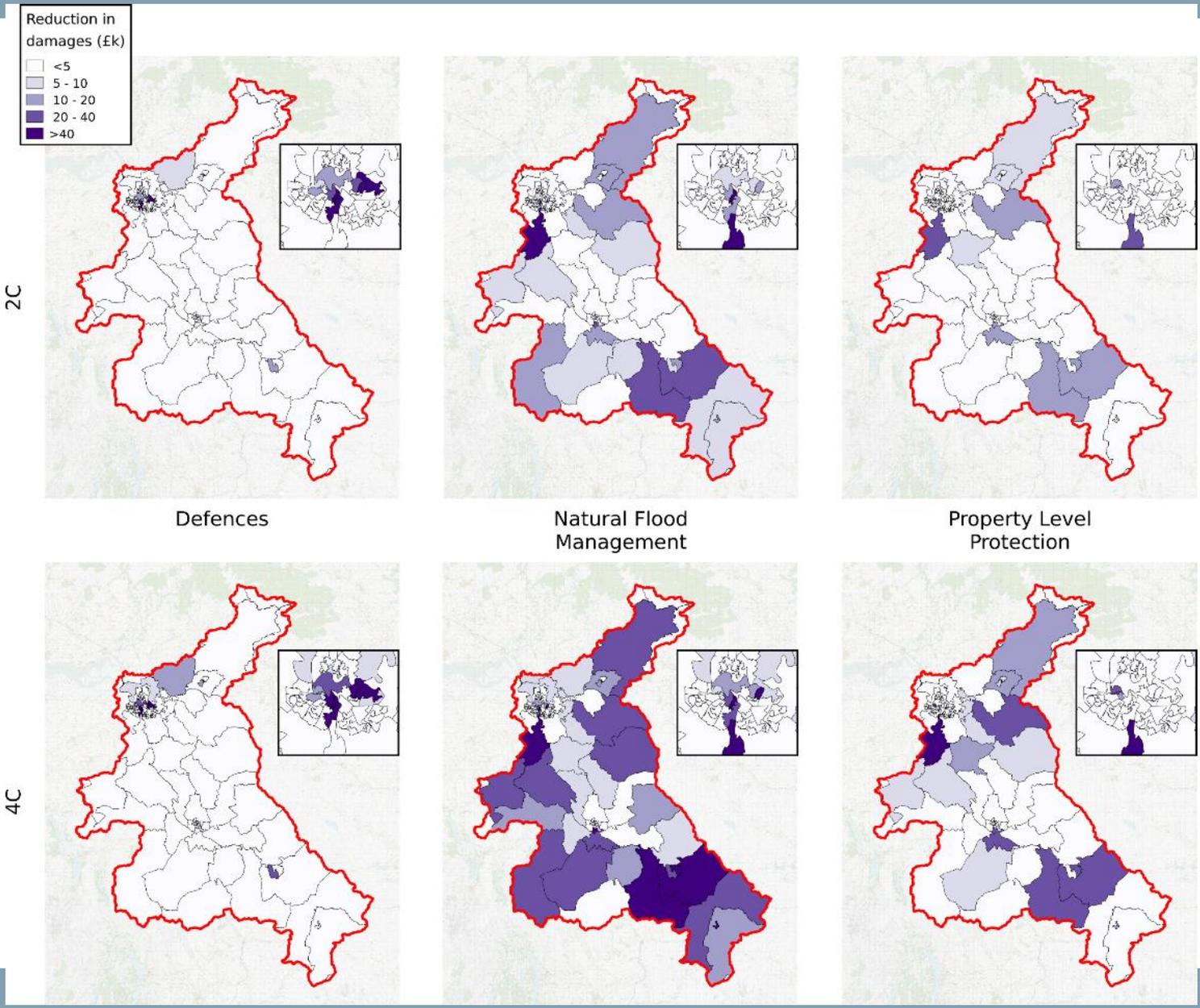
Example results

Drivers of increased risk and ability for adaptation to reduce risk (2°C high population growth, 2050s)

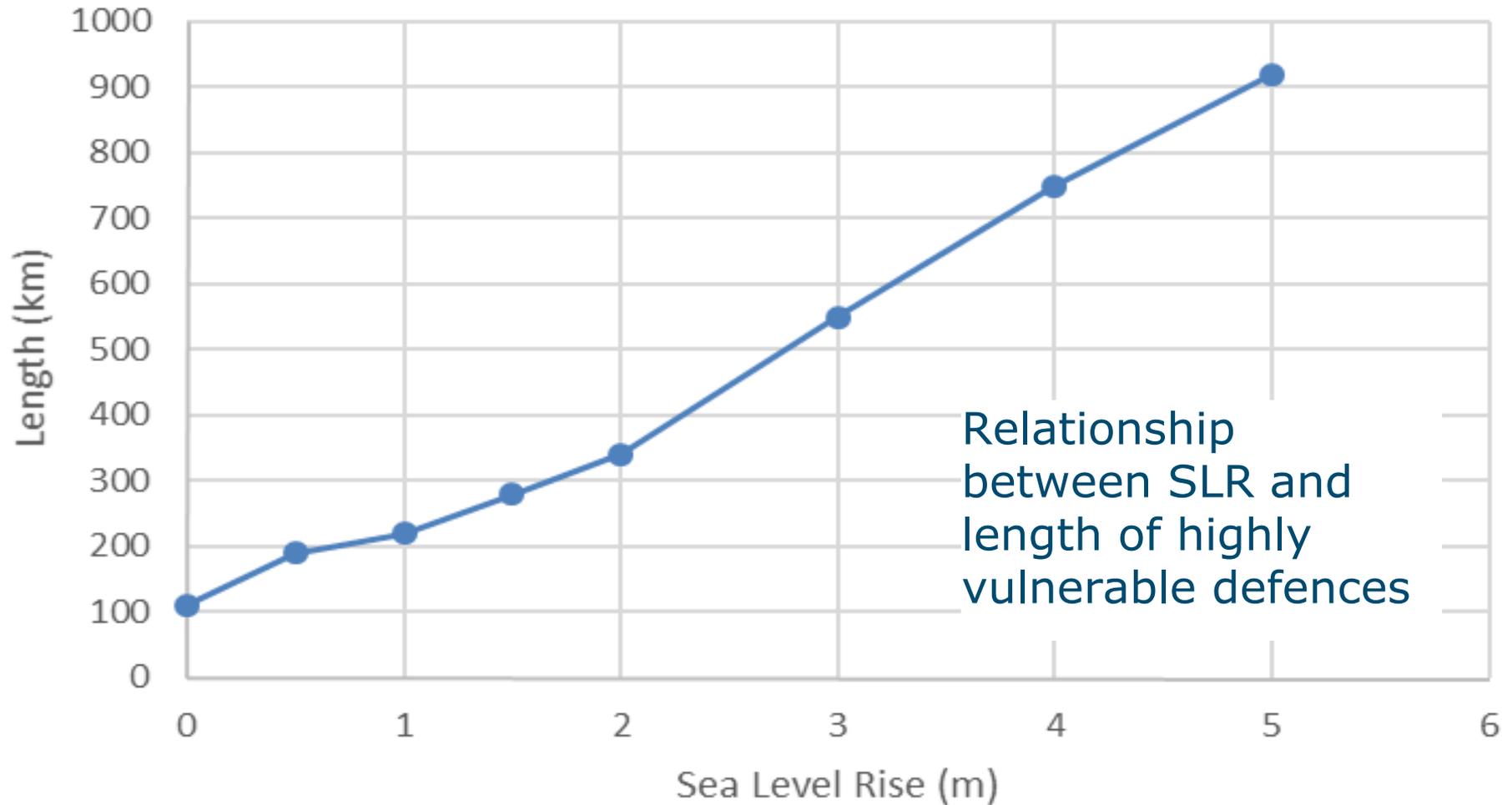


But how much does each adaptation measure contribute?

A disaggregation of the contribution to risk reduction (EAD) from individual measures as part of a portfolio (Example for Cumbria, Sayers and Horritt, 2016)



Can shoreline defences maintained ?



If we 'carry on' as we are, how do risks change?

- **Increases in flood risk are projected to occur as early as the 2020s and significantly by 2080s:**
 - 50% under 2°C
 - 150% under 4°C
- **The increase varies across the UK; in some regions three times greater than in others.**
- **Climate change is the main driver of increased risk, population growth is much less important**

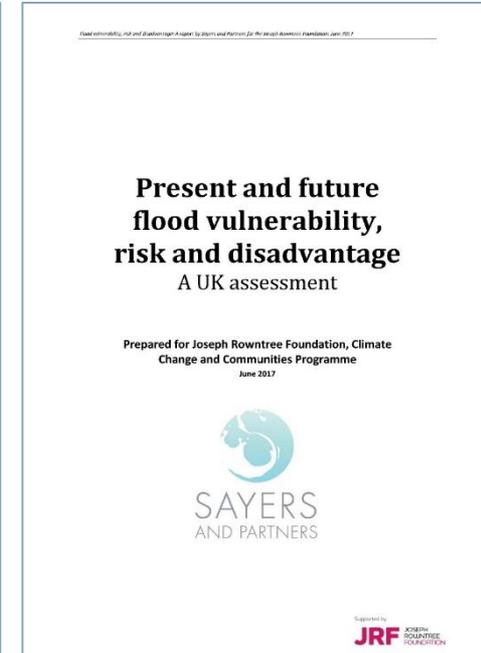
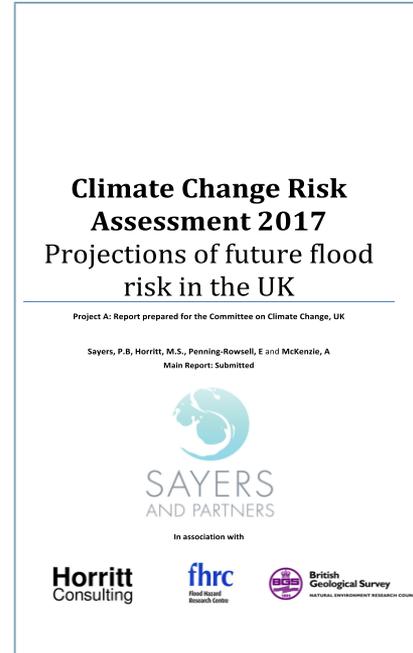
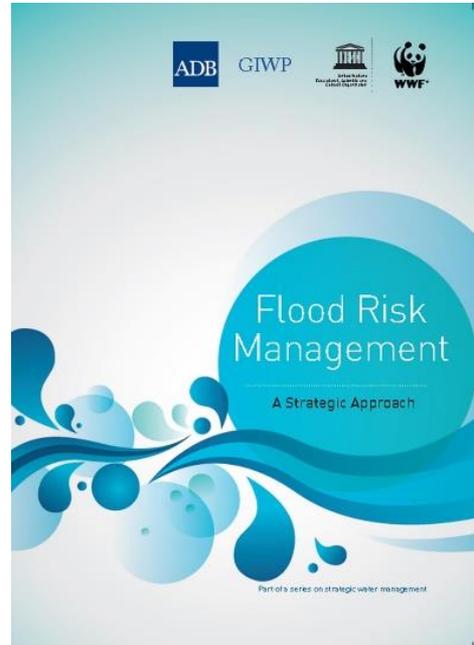
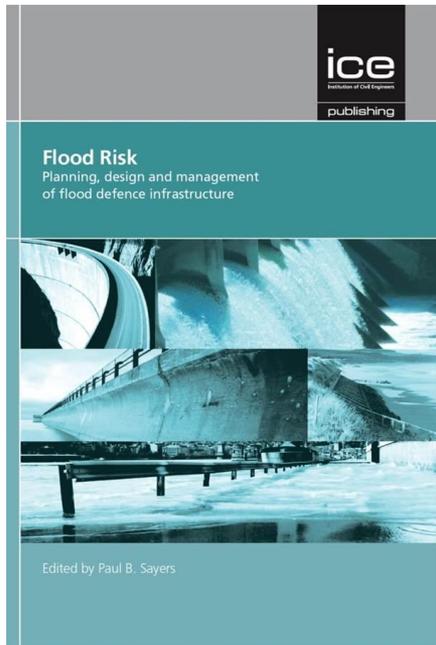
If we adopt a more ambitious approach to adaptation what is the impact on future flood risk?

- **Enhanced Whole System adaptation can offset**
 - all the increase in risk under the 2°C climate change, and
 - 70% of the increase in risk associated with the 4°C climate change
- **This requires the implementation of an ambitious portfolio of measures to manage probability, exposure and vulnerability**

And where next for the UK Future Flood Explorer itself..

- **The FFE is well suited to large scale analysis and exploration of alternative futures (currently being applied in Ethiopia and Kenya)**
- **Recent extensions to explore issues of social justice in flood risk management in the UK (see Sayers and Knox at this conference)**

Some further information



Sayers et al, 2017. Present and future flood vulnerability, risk and disadvantage (in press)

Sayers et al 2017.

Sayers et al, 2015 **Climate Change Risk Assessment 2017: Future flooding report.**

<https://www.theccc.org.uk/publication/sayers-for-the-asc-projections-of-future-flood-risk-in-the-uk/>

Sayers P B, Galloway Gerry, Penning-Rowse Edmund, Shen F, Wen K, Chen Y, Le Quesne T (2014). **Strategic flood management: ten 'golden rules' to guide a sound approach.** Journal: International Journal of River Basin Management

Sayers P et al (2014) **Strategic flood risk management.** Published by GIWP, China, UNESCO and WWF. Part of series on strategic water management.

<http://www.sayersandpartners.co.uk/strategic-water-management.html>

Sayers, P. (Ed.). (2012). **Flood risk: Planning design and management of flood defence infrastructure** (1 ed.). London: Institution of Civil Engineers Publishing.

- **Further detail**

- Sayers et al, Climate Change Risk Assessment 2017: Future flooding report.

<https://www.theccc.org.uk/publication/sayers-for-the-asc-projections-of-future-flood-risk-in-the-uk/>

- **Funding**

- Primarily provided by NERC via the Committee on Climate Change for the CCRA. The NERC FoRUM (Grant NE/M008851/1) supported the use of the FFE in the validation of the national scale risk analysis for England.

- **Contact**

- Paul Sayers
 - Paul.sayers@sayersandpartners.co.uk
 - Skype: floodsman
 - Telephone: 01865 600039