The OpenCLIM Project: supporting future risk and adaptation assessments

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Environmental Impacts

DAFNI Conference 2022

OpenCLIM Project

Background

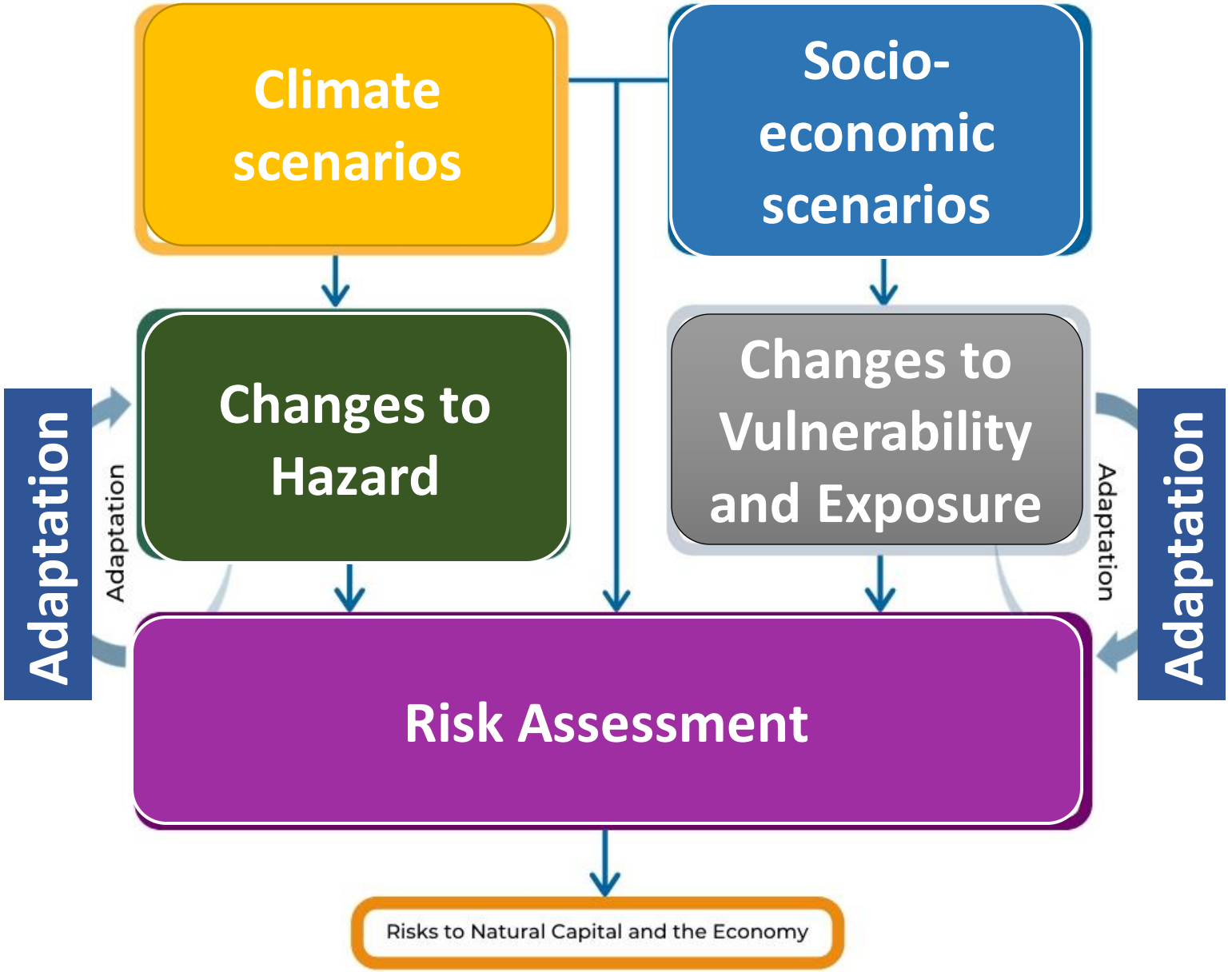
- Goal: to deliver the assessment method for Climate Change Risk Assessment 4 (CCRA4) and beyond –i.e., enhance the UK's capability to assess climate change risks and adaptation choices
- The vision is to link state-of-the-art risk and adaptation models in an open and integrated framework around a community of developers and users
- This will provide consistent and spatially explicit results
- Funded under the UK Climate Resilience programme
- Using DAFNI for software integration and a robust legacy

OpenCLIM Project

Key Issues

- Linking state-of-the-art models within an integrated framework (developing a bigger more complex model)
- This linkage involves substantial development
    - the integrated model framework design,
    - model coupling and
    - the role of adaptation
- Stakeholder engagement to make sure that results are useful and engage
- Facility to update and add new models
- Legacy: to ensure long term sustainability for CCRA4 and beyond

OpenCLIM Structure

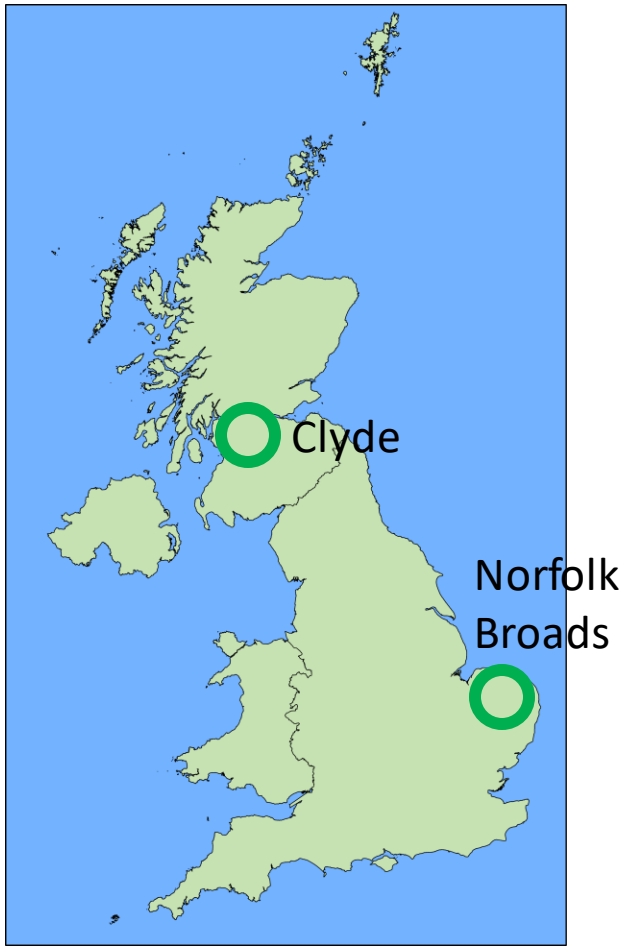


Exploring six sectors/workflows

1. Urbanisation
2. Biodiversity
3. Agriculture
4. Heat stress
5. Inland flooding
6. Water supply

The framework is modular – other components can be added in the future

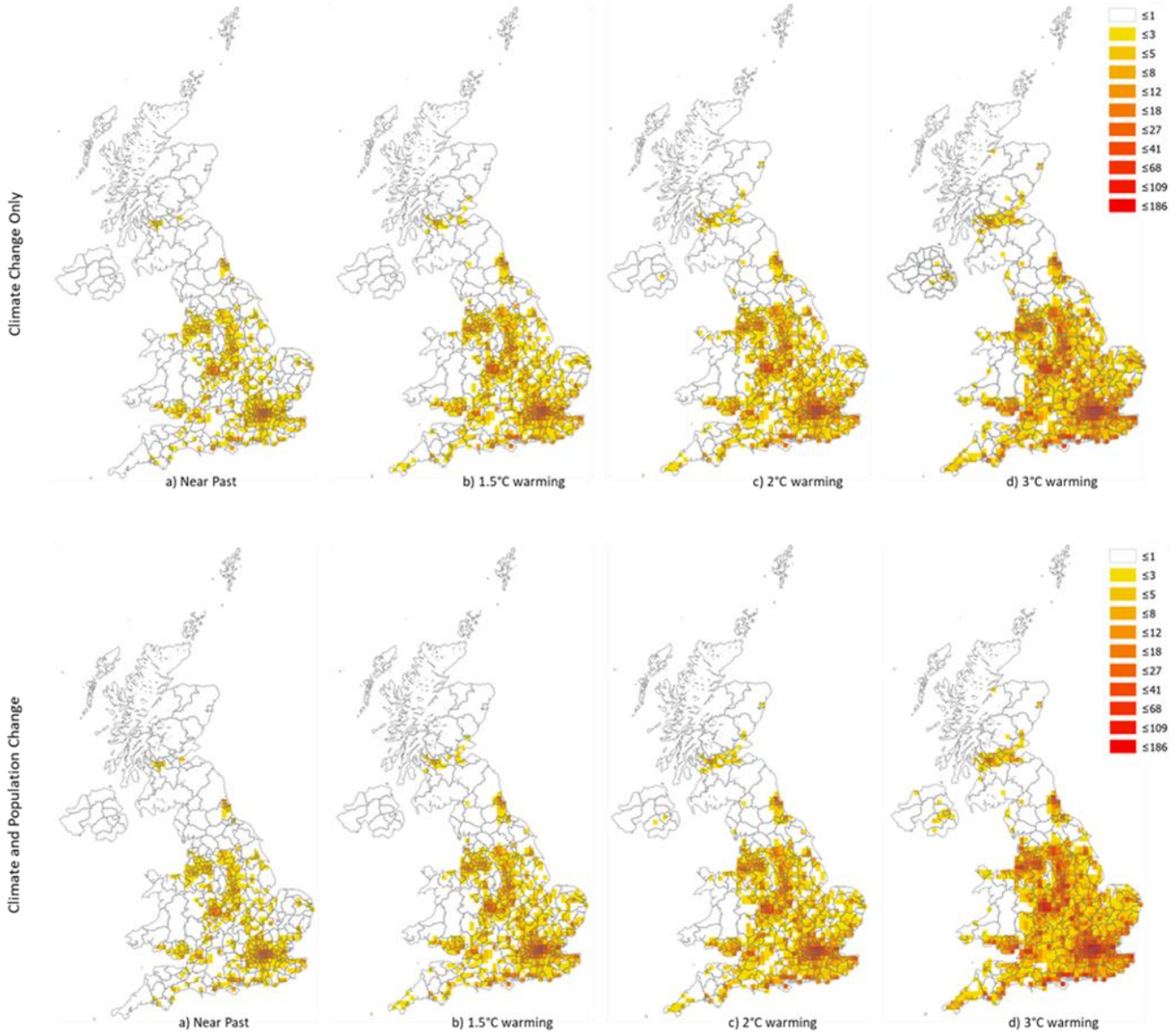
Geographical Coverage



Results Available

- Nationally – United Kingdom
- Devolved Administrations
- Sub-National
  - Clyde
  - Norfolk Broads
  - *Highlands*
  - *SE Scotland, incl. Edinburgh*
- *Local Authorities*
- *Sectors*
- *Etc.*

National heat-stress-related mortality (University of Bristol)



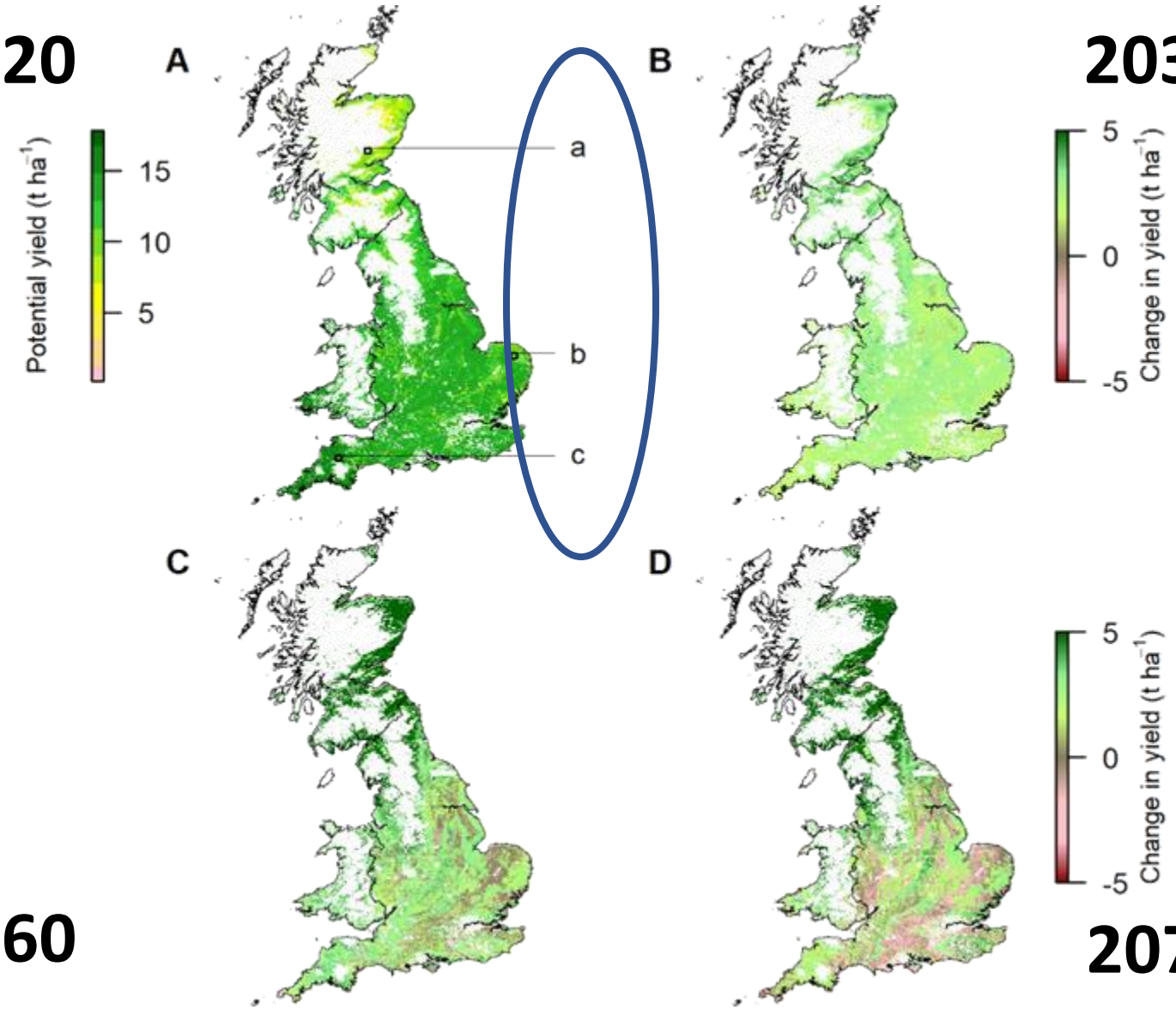
Spatial pattern of average annual heat related deaths in the UK for all ages (mean estimates across the 12 RCMs are shown)

Results assuming climate change only (top) and the bottom panel with climate change and population change (UK-SSP5).

Note: As part of OpenCLIM regional heat-mortality curves will be flexibly modifiable (e.g., based on any updated ONS/PHE data)

Crop-NET Yield Model
Winter Wheat (CEH)

2010-2020



2030-2040

2050-2060

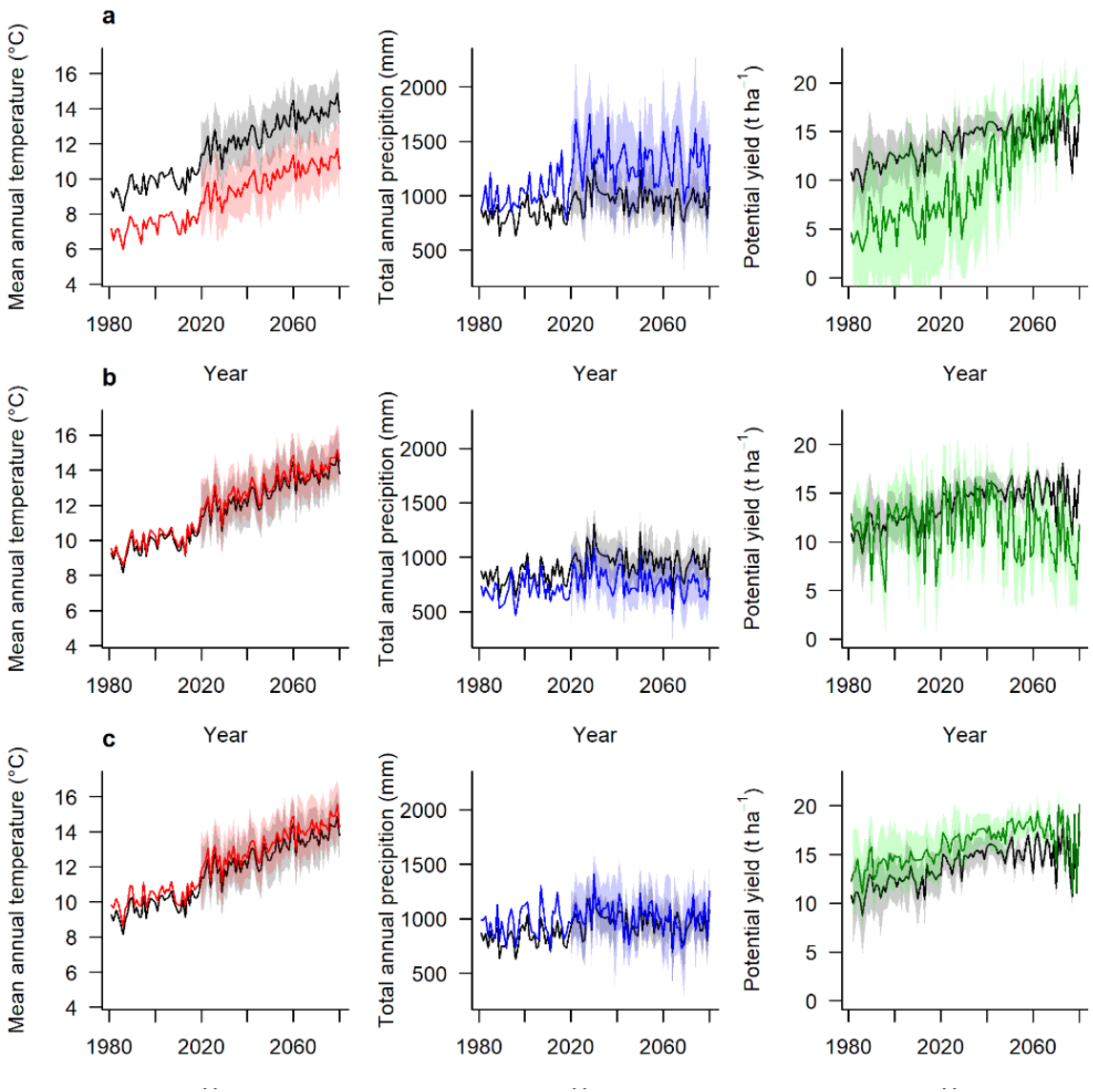
2070-2080

Winter Wheat Yield Model: 2020-2080

a) Scotland

b) East England

c) SW England

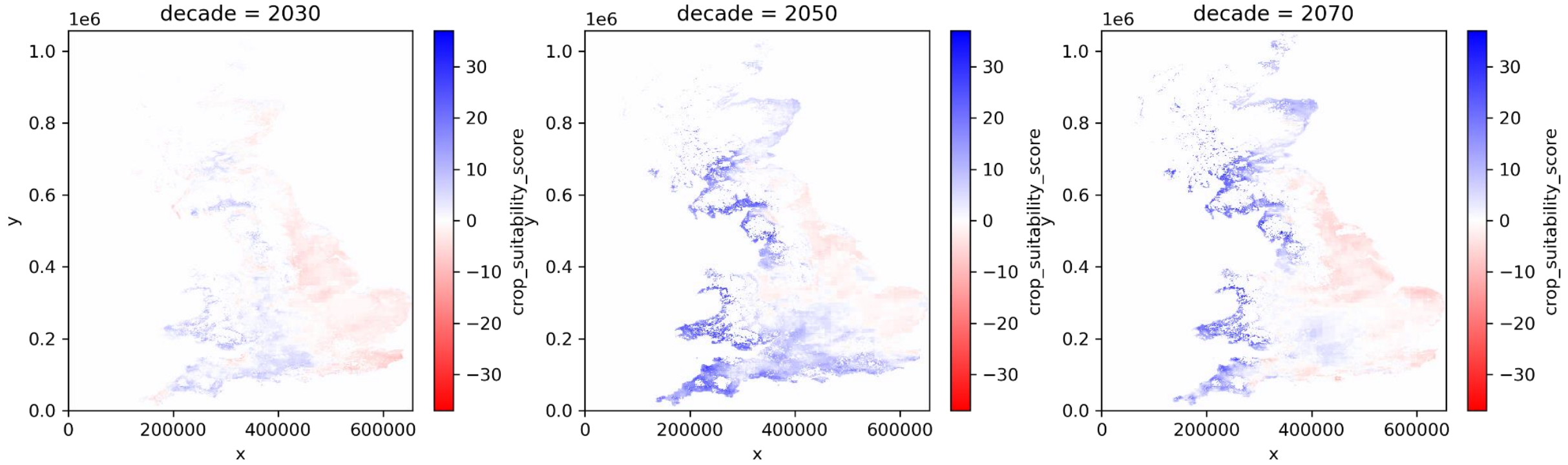


- *Solid line = single UKCP18 ensemble member*
- *Shading = min-max*
- *Black line = GB average*

Temp Precip Yield

Combined Suitabilty Sweet Potato

2020-2080. EcoCrop -- CEH



UK Centre for Ecology & Hydrology

Tyndall Centre for Climate Change Research 21 years

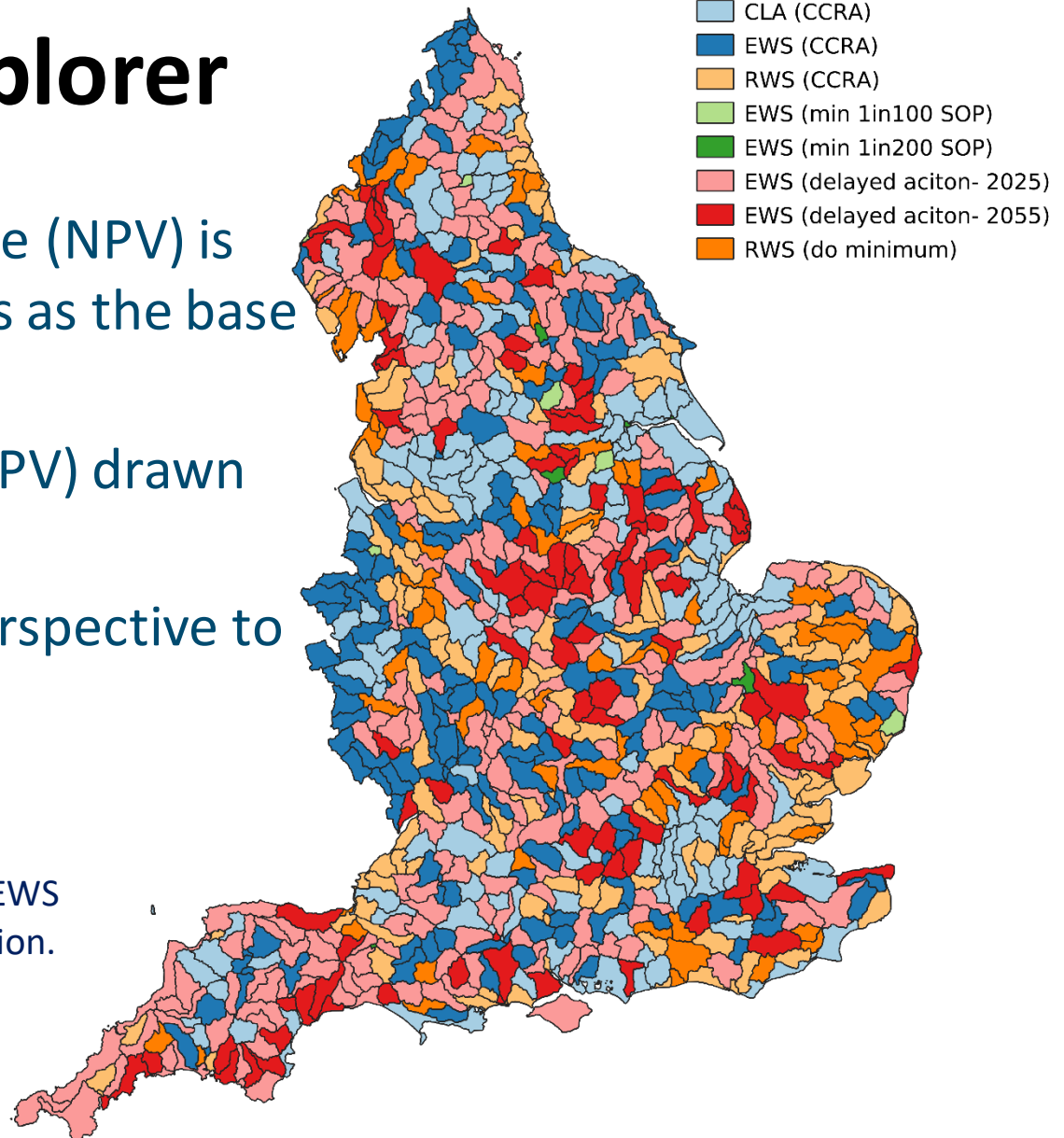
Flood adaptation portfolios – Illustrative Analysis With Future Flood Explorer

(Paul Sayers)

Adaptation option with maximum Net Present Value (NPV) is indicated using EA Flood Risk Management Systems as the base decision unit

- Indicates the preferred adaptation (based on NPV) drawn from multiple alternative adaptation portfolios
- OpenCLIM will provide better data and a UK perspective to enhance these adaptation portfolios.

The basic portfolios follow CCRA3 with variants
(1) EWS -- enhanced whole system adaptation; (2) CLA -- continuation of current levels of adaptation; (3) RWS -- reduced whole system adaptation; EWS can be varied by increasing the minimum standard or delaying implementation. RWS can be enhanced by greater reductions in adaptation action.



UEA 10 University of East Anglia
Newcastle University
University of BRISTOL
CEH Centre for Ecology & NATURAL ENVIRONI

OpenCLIM and DAFNI

- Data structure – much more flexible to a range of outputs/questions
- Consistent underlying assumptions are inherent
- Avoids start-stop activity – this is building a process and foundation (with commitment and funding)
- Access remains an issue as these models are complex
  - OpenCLIM workflows as an evolving scientific resource allowing a wide range of queries by experts – progressive improvement
  - Data cubes sampling this space for specific queries – a searchable database
  - Web interface for tightly defined queries – essentially specific models *within* OpenCLIM with well defined inputs and outputs

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