Learning from Providing and Those Using UKCP09

Wednesday, 16th August 2012

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Technical Director, Adaptation Science

Why UKCP09?

- Fifth generation of climate information for UK
- Response to request by users for
  - Greater transparency on the uncertainty in projections of future climate -> probabilistic projections;
  - Enhanced spatial and temporal resolution -> 25km and seven overlapping 30-year time periods;
  - Marine information -> marine and coastal projections
- Desire by users to move from impact assessment to identifying viable and robust adaptation options
- Broadening of user community – from primarily research to decision support
- Reflected what the science community could deliver based on the climate science, analytical capabilities and computer capabilities.

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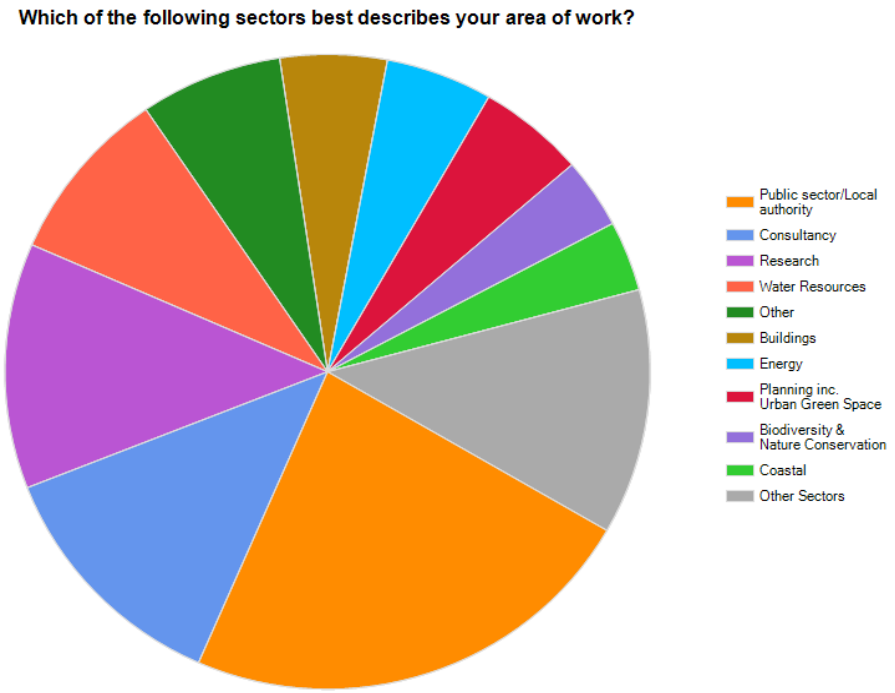
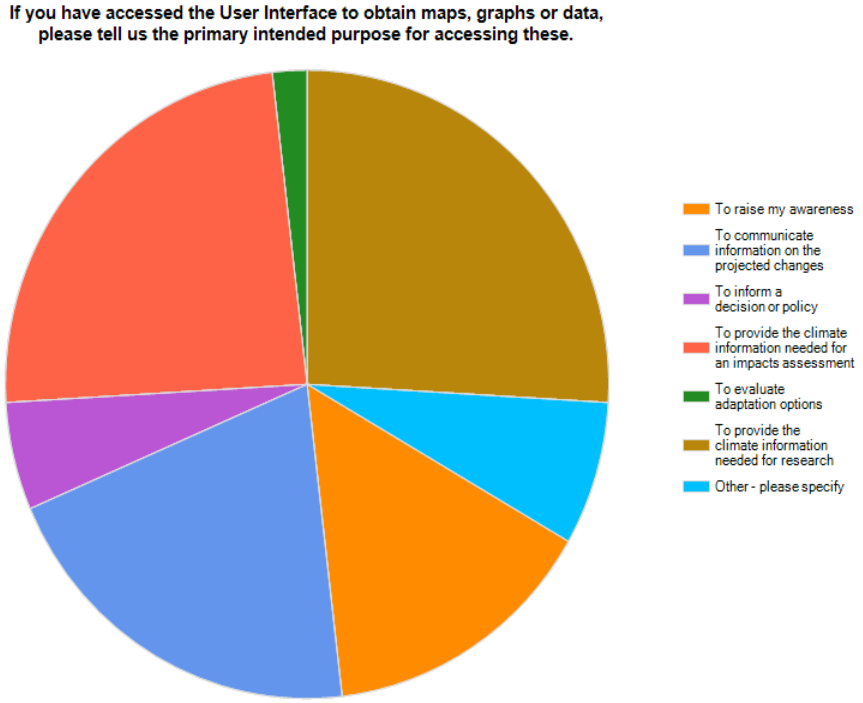
Who are the Users? Why are they using?

More than researchers



For more than research



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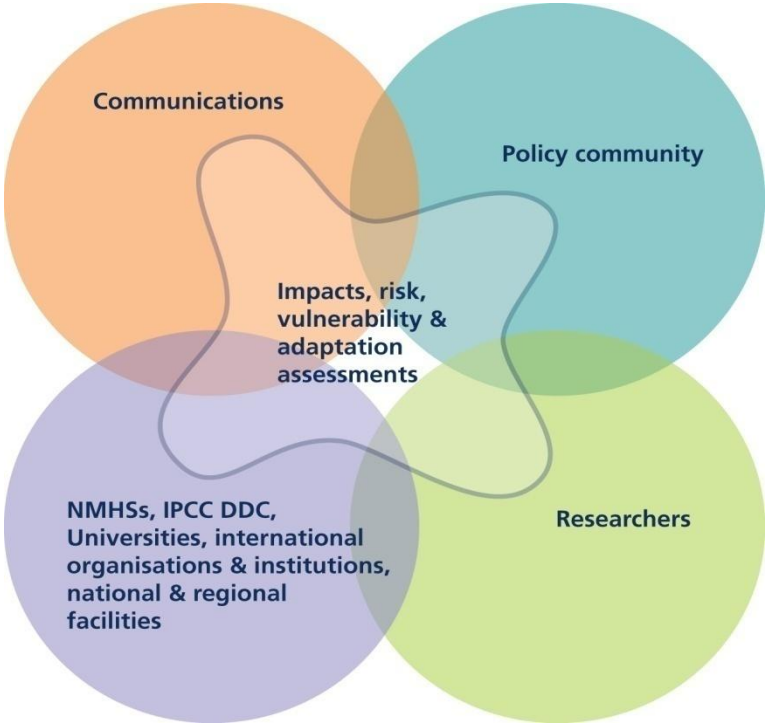
Engaging Stakeholders – Providers and Users

Who are the Providers?

- NMHSs, IPCC and its DDC, Universities, International Organisation and Institutions, National / Regional Facilities, and consultants



What is required? More than consultations!

Need for informed and sustained engagement involving both users and providers throughout the process – development, dissemination, providing support, and continuous improvement.

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Mechanisms for Engaging – Shared Learning

Users' Advisory Panel – representatives of the users and providers

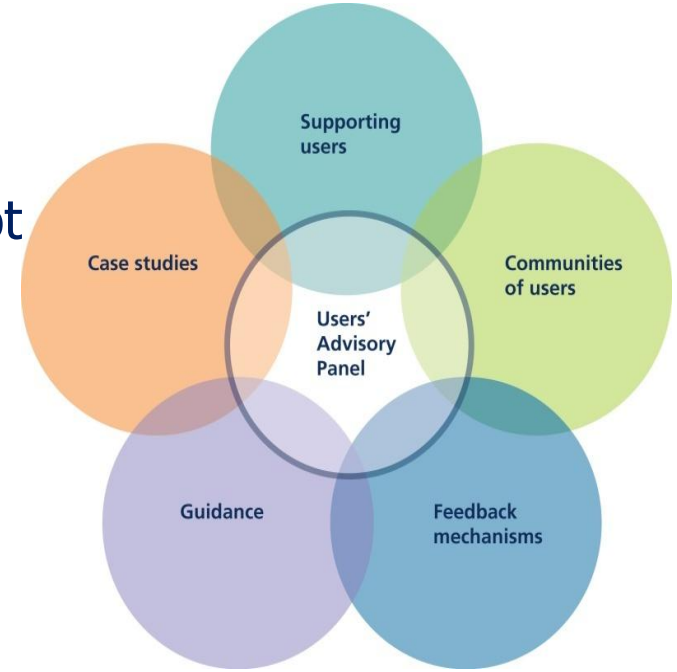
- Providing advice and feedback on proposed directions and developments
- Opportunity to suggest enhancements and extras – new and modifications to the information and support provided

Communities of Users – common interests

- Opportunities to share lessons learned and challenges of using the information – working as a community
- Working with the providers and other experts / practitioners

Guidance (online and hard copy)

- How the information can be used and should not be used and why
- Linking the uses (impacts, vulnerability, risks and adaptation) to the climate science



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Mechanisms for Engaging – Shared Learning

Case Studies – part of the guidance

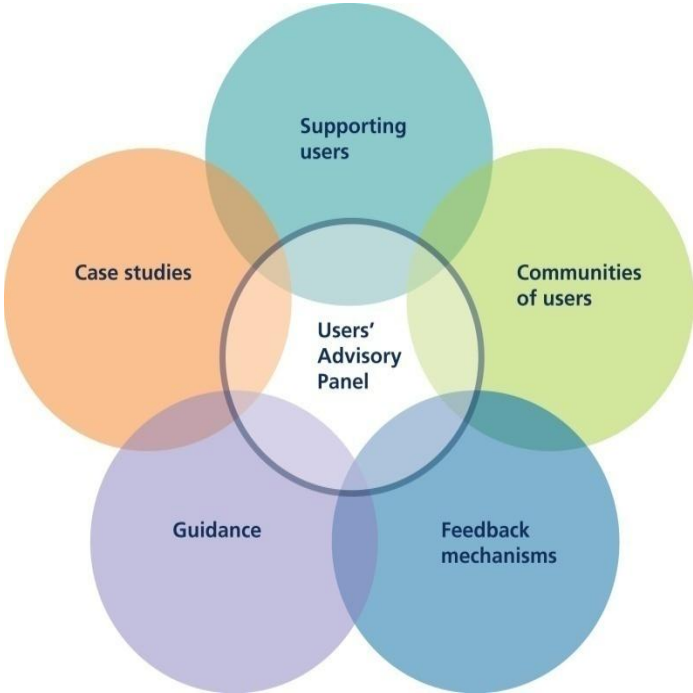
- How others have used what information and why they have chosen to do so
- Working with users to demonstrate potential uses

Feedback Mechanisms

- Online feedback opportunities – helpdesk
- Online forum, feedback surveys and questionnaires

Supporting Users

- Training (face-to-face) and online (including e-learning and webinars)
- Working with users as part of their assessment processes



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Positive Impacts of Engagement

- Delivered information that is recognised as directed at informing use rather than just describing the climate
- Guidance and User Interface designed and tested with users
- Language and terminology understandable to users
- User buy-in (ownership) in the process and the products
- Users providing and using case studies
- Providers have a better understanding of users needs and priorities
- Users have a better understanding of what can and cannot be delivered and how climate information can and cannot be used
- Desire by users and providers to sustain engagement

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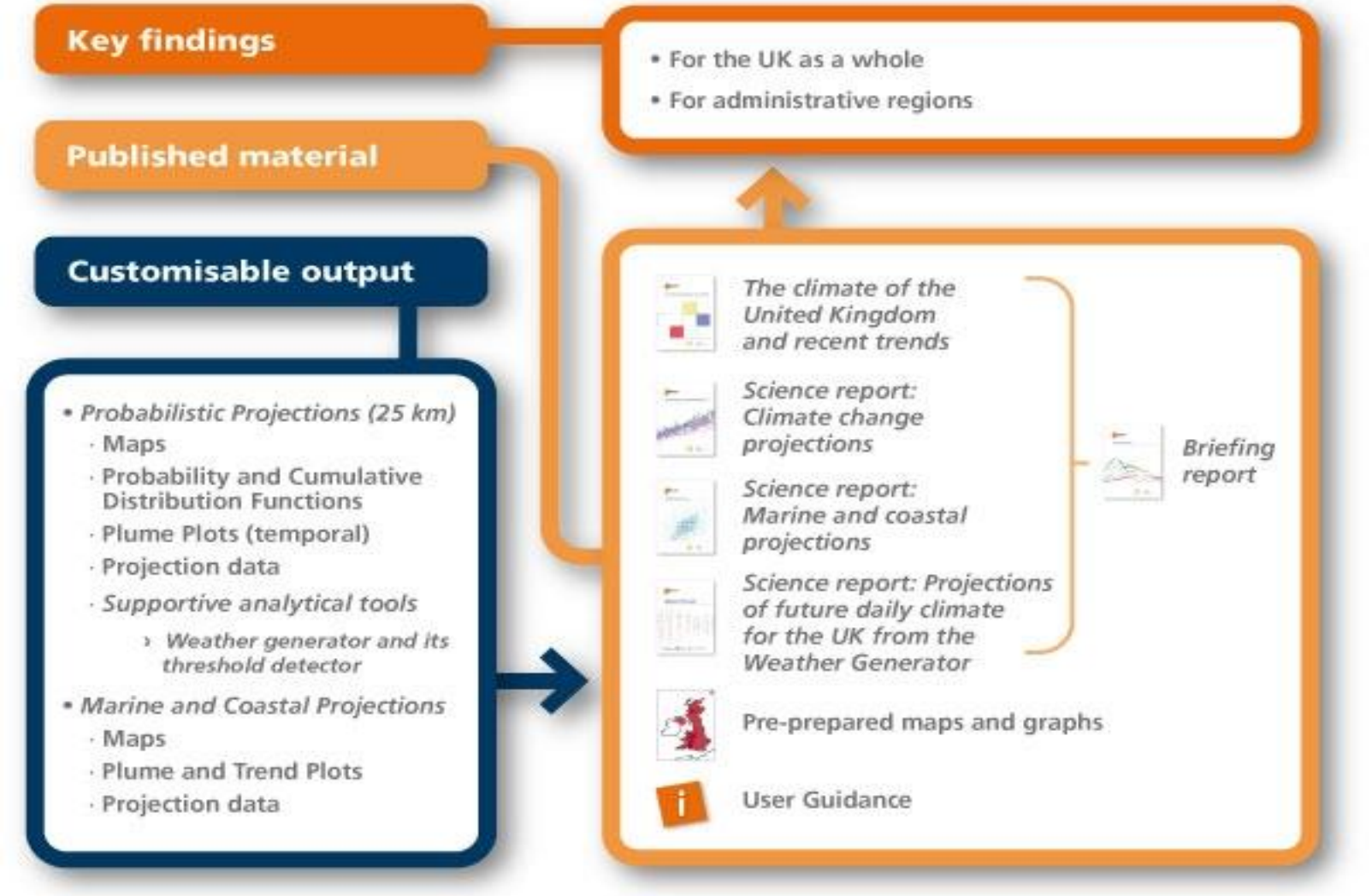
How has UKCP09 been provided to users?



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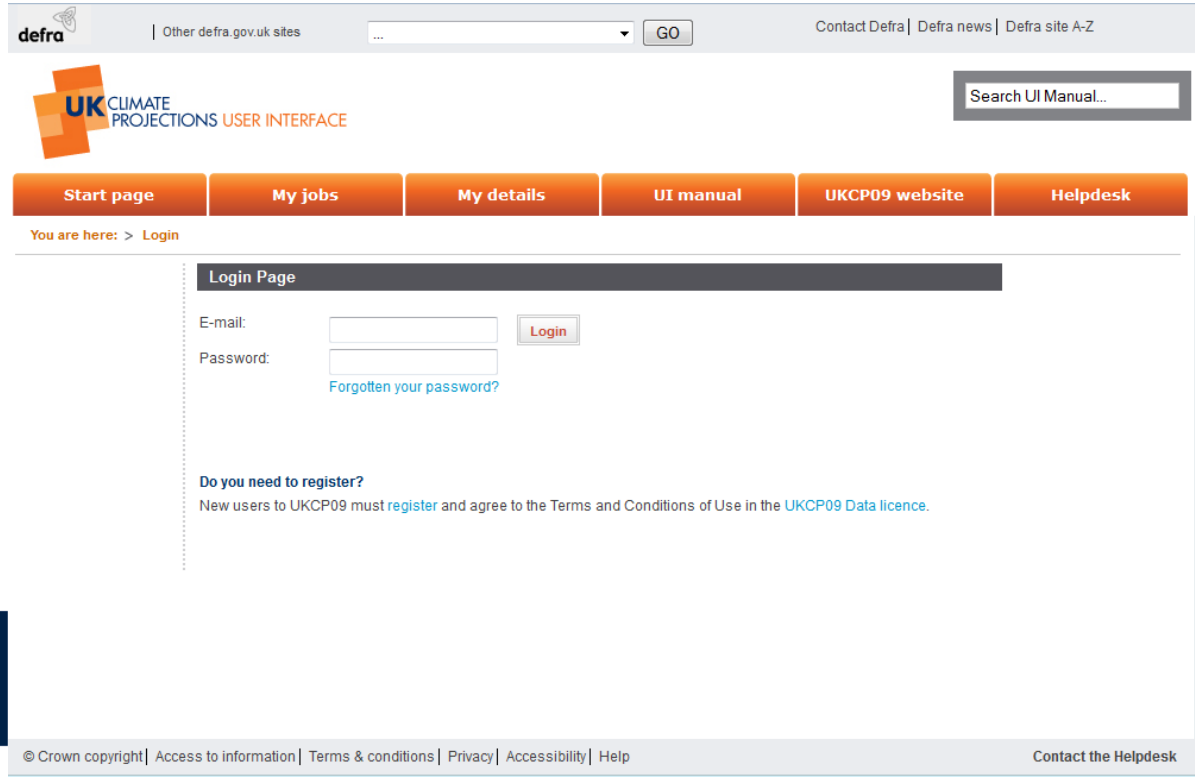
Supporting UKCP09 Users

User Guidance

User Interface

To access customisable output and includes supporting information and Manual providing guidance when building a request



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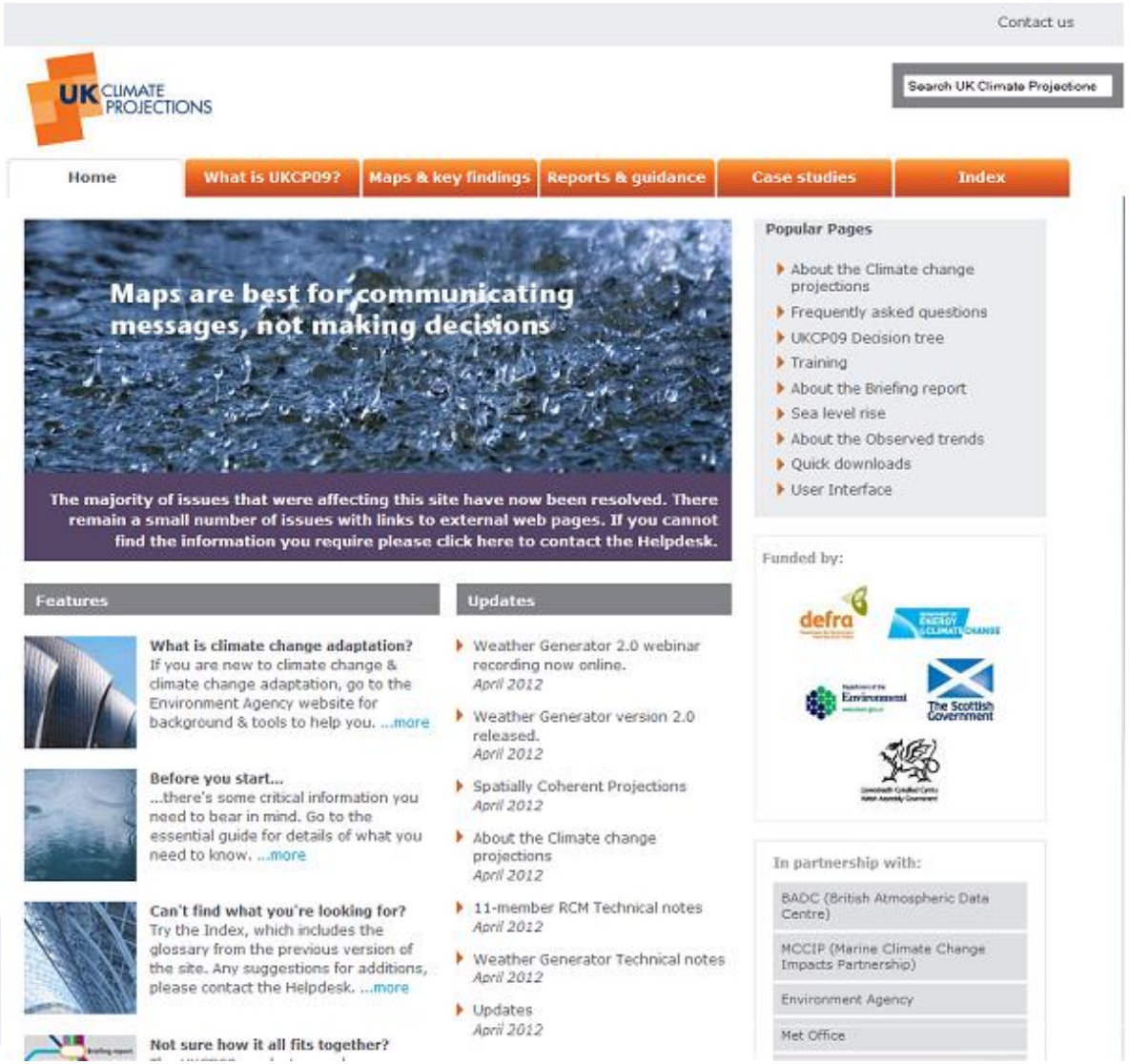
UKCP09 Web Site
http://ukclimateprojections.defra.gov.uk

All are integrated within the UKCP09 website

- Providing access to reports (with navigation) and preprepared information
- Access to the UKCP09 User Interface
- Guidance and case studies
- FAQs
- Technical Reports



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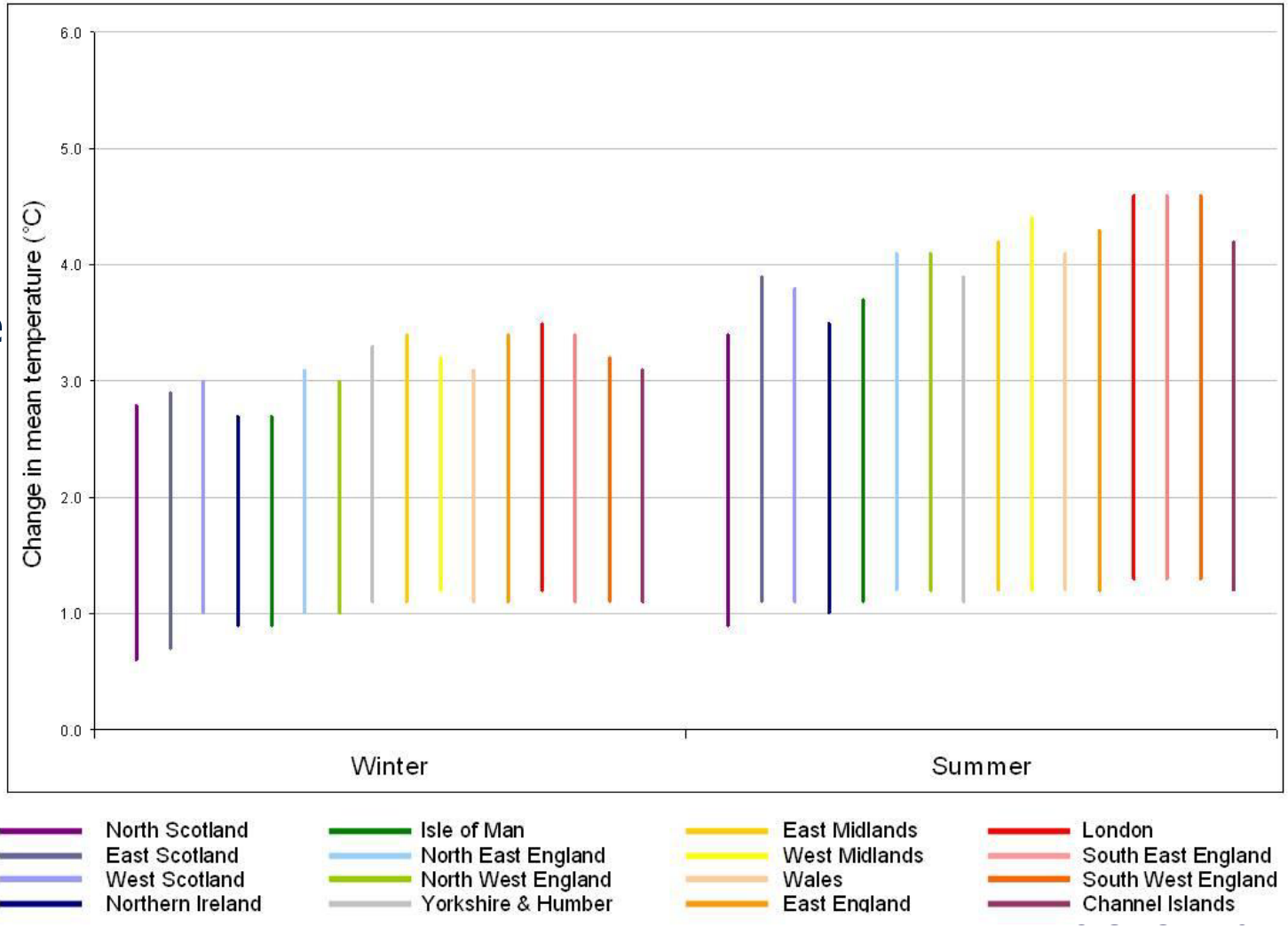
Using UKCP09

Use of UKCP09 within the UK CCRA

The CCRA response functions present changes in consequence versus key climate variables.

Single variable - UKCP09 outputs used directly making use of the 10, 50 and 90% probability levels



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Use of UKCP09 within the UK CCRA

The CCRA response functions present changes in consequence versus key climate variables.

- Derived variables or combined climate variables from UKCP09 are used (e.g. relative aridity or PET), UKCP09 sampled data used (10,000 values for each emissions scenario) to produce 10, 50 and 90% probability levels for that variable (combined probability are represented)
- For sea level rise, use of the UKCP09 Marine Scenarios (not full probabilistic data) and additional work on the High ++ scenario.
- For climate variables and phenomena that are not covered by UKCP09 probabilistic projections, used related information from RCM where possible or flagged these issues up and included a qualitative narrative and expert opinion to inform the assessment.

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UKCP09 Projections – Understanding the distributions

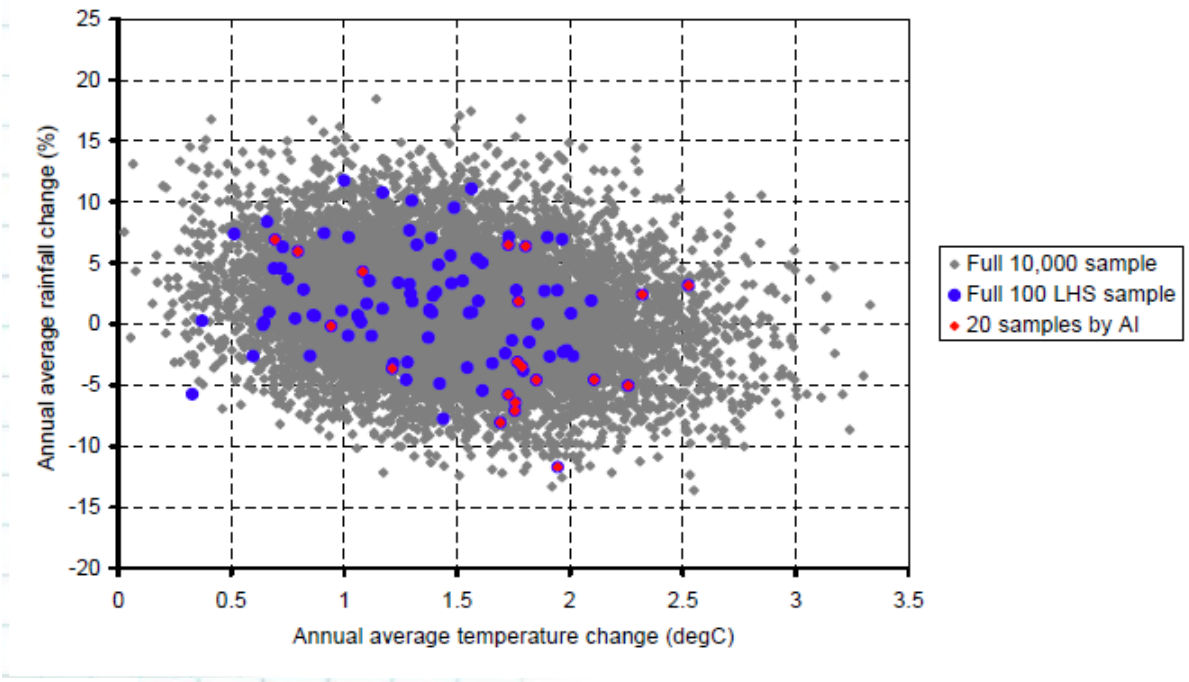
2020 A1B Thames River Basin (% of 10,000 UKCP09 samples)

		Temperature				
		Little change (< 0.5 °C)	Warmer (0.5 -1.5 °C)	Hotter (1.5 -2.5 °C)	Much Hotter (> 2.5 °C)	Sub-total
Rainfall	Wetter (> 5%)	0	3	3	0	7
	Little wetter (0 – 5 %)	1	22	17	1	42
	Little drier (-5 -0 %)	1	22	18	1	42
	Drier (< -5%)	0	5	4	0	10
	Sub-total	3	52	42	3	100

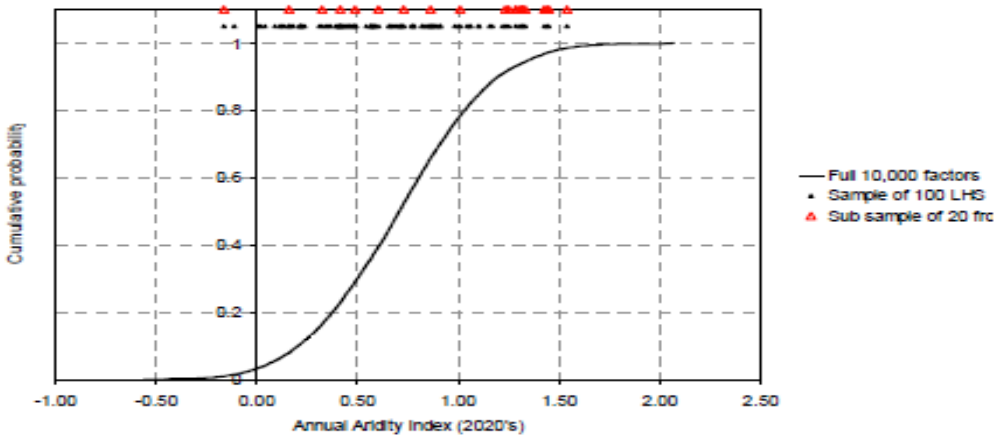
Sampling UKCP09 to Support Analysis

Maximise confidence and minimise number of model runs needing to consider

Using Latin Hypercube sampling - better than random sampling and provides representative sample checking seasonal factors for rainfall and temperature



Sub-sample based on Aridity Index leads to 20 climates



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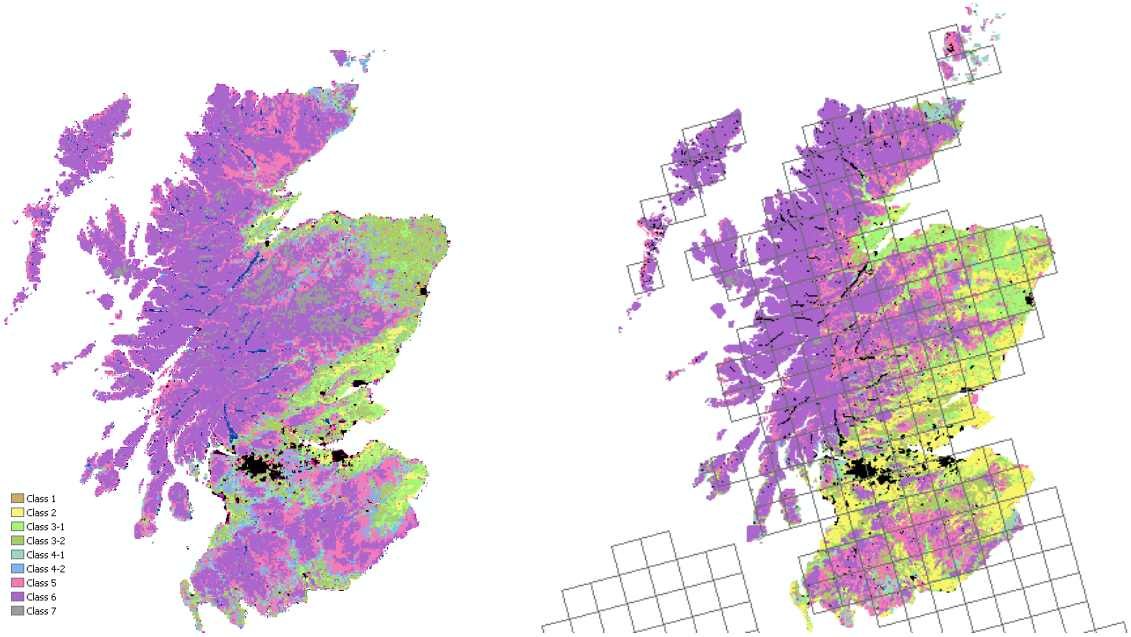
Land Capability for Agriculture - Scotland

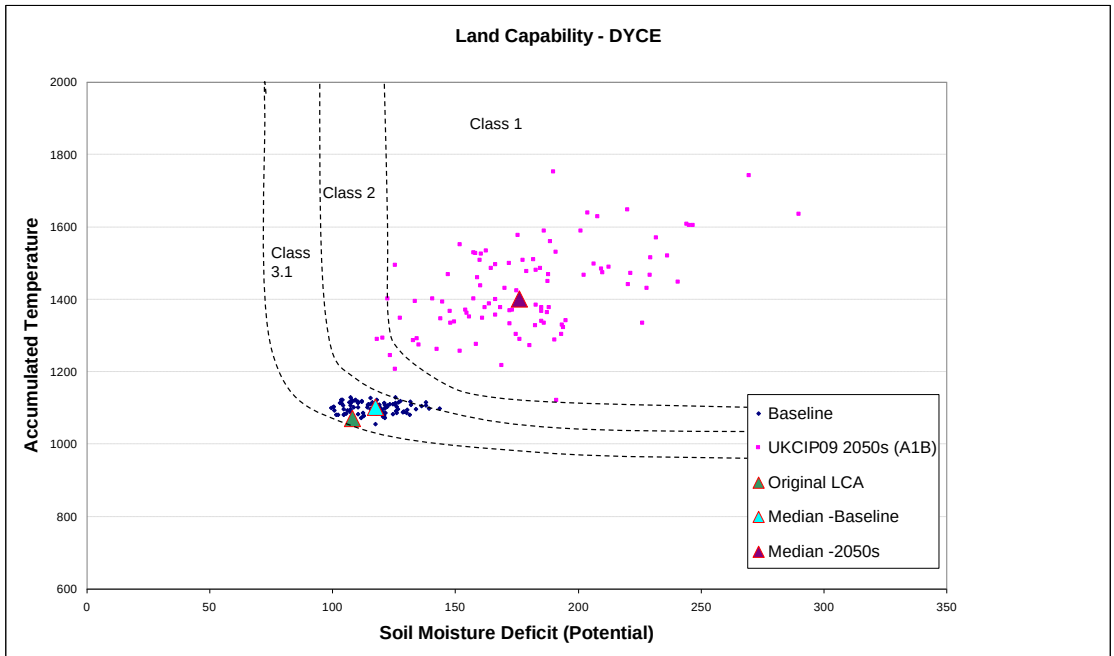
LCA Maps for baseline and for 2050s (RCM simulations bias corrected and downscaled, medium emission scenario)

- General increase in land capability for many areas (drought risk may limit these gains)



Dyce (Aberdeen) using metrics calculated from the 100 baseline and 100 simulations for 2050s (medium emission scenario)

Need to include the complex soil-climate interactions that also occur in the future (drought, wetness and erosion)



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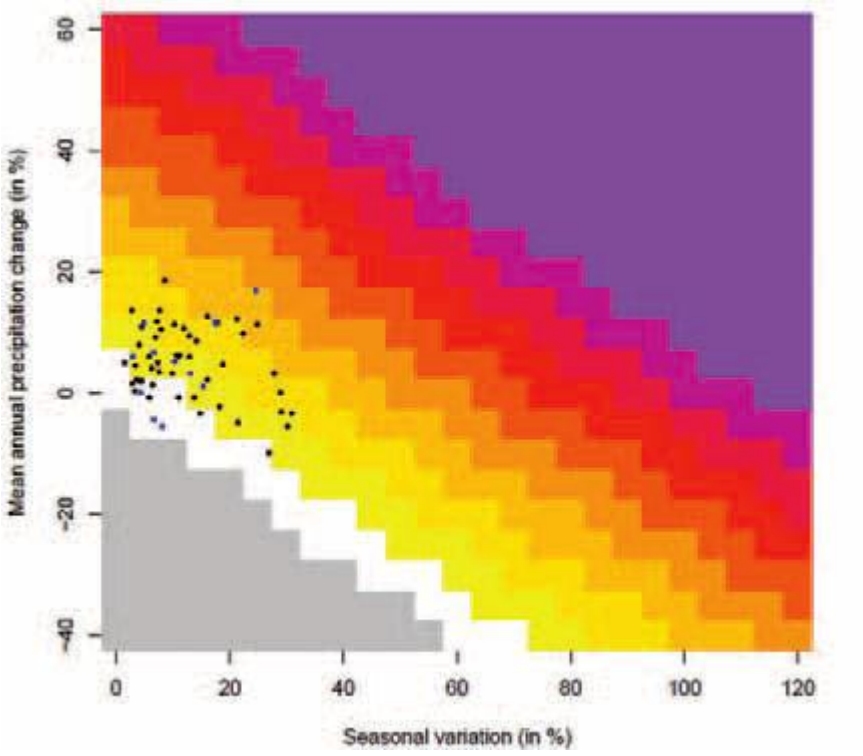
Impacts and Risks Assessments

- Identifying the behaviour of the system of interest (catchment responses – flood flows) with projected changes in climate (annual precipitation change and a measure of seasonal variation of precipitation) across plausible ranges
- Different scenarios (GCM scale are plotted for a specific time period in the future



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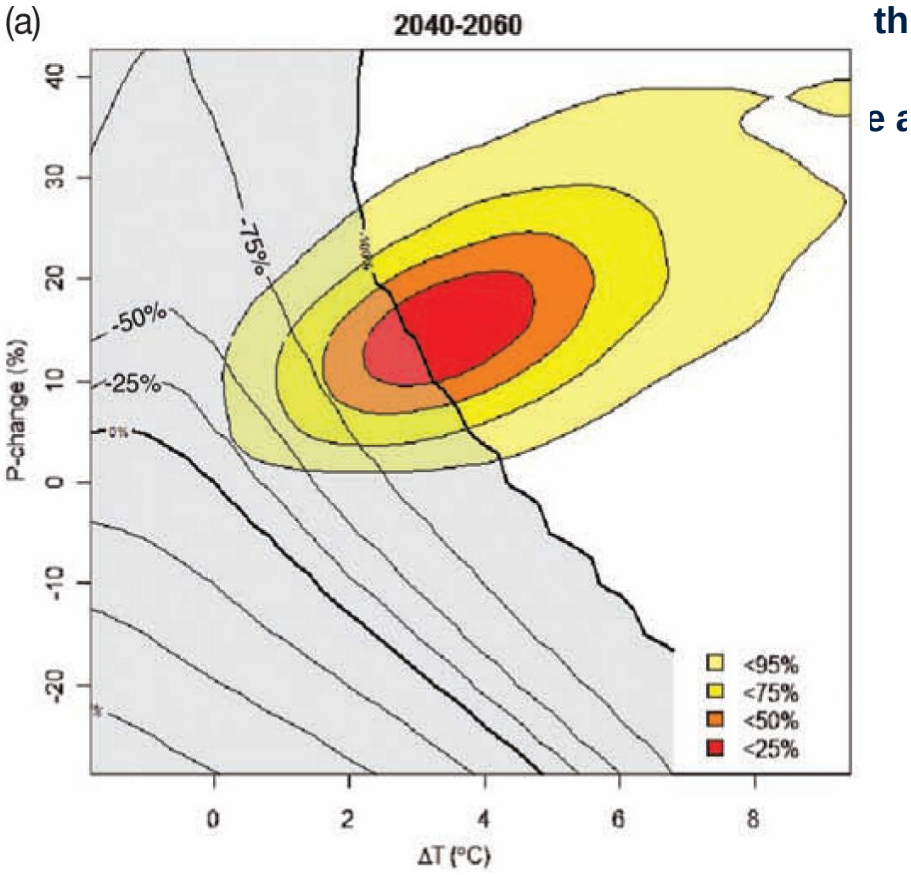
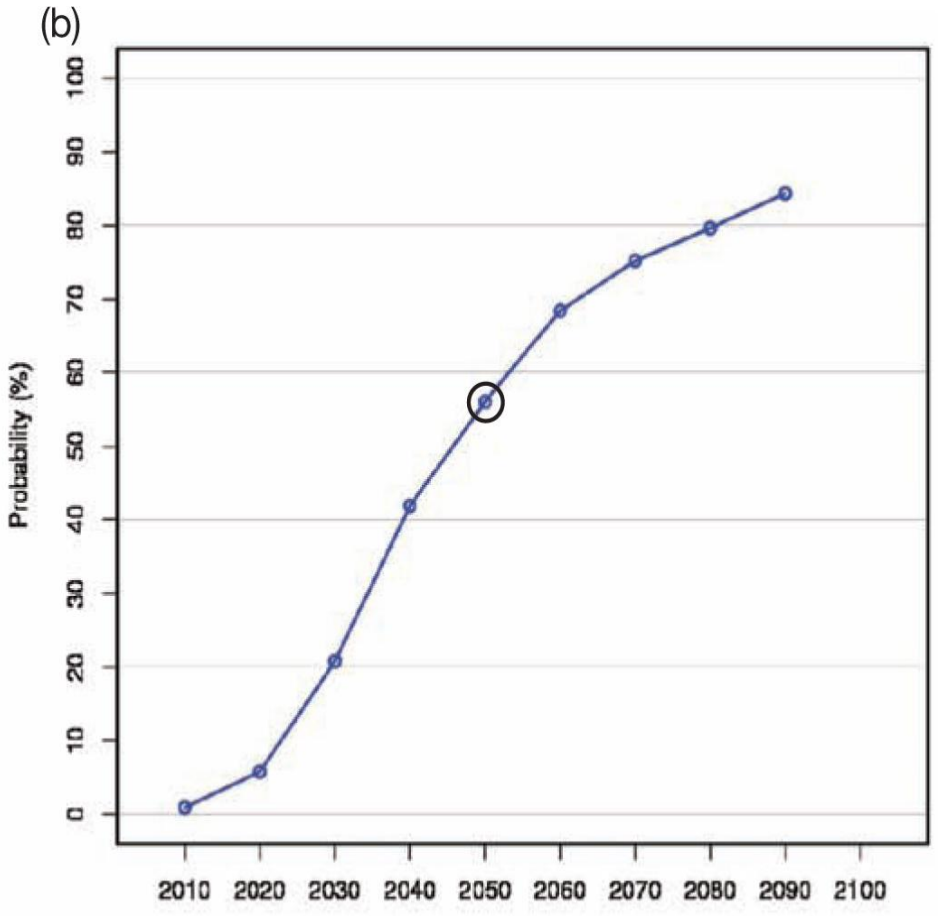
Department for Environment Food and Rural Affairs

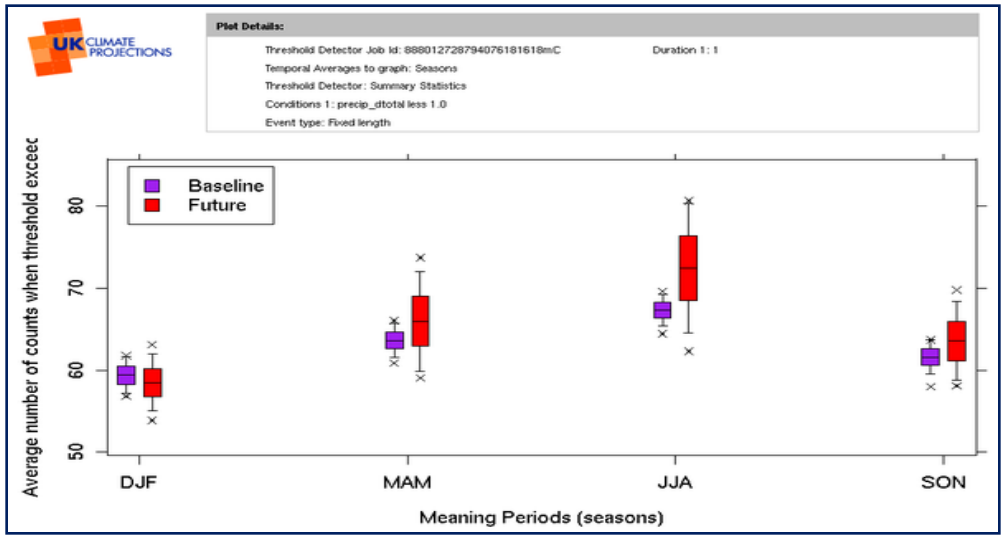
(a) Impact response surface showing modelled percentage change in area of suitability for palsa mires as a function of changes in mean annual temperature and precipitation relative





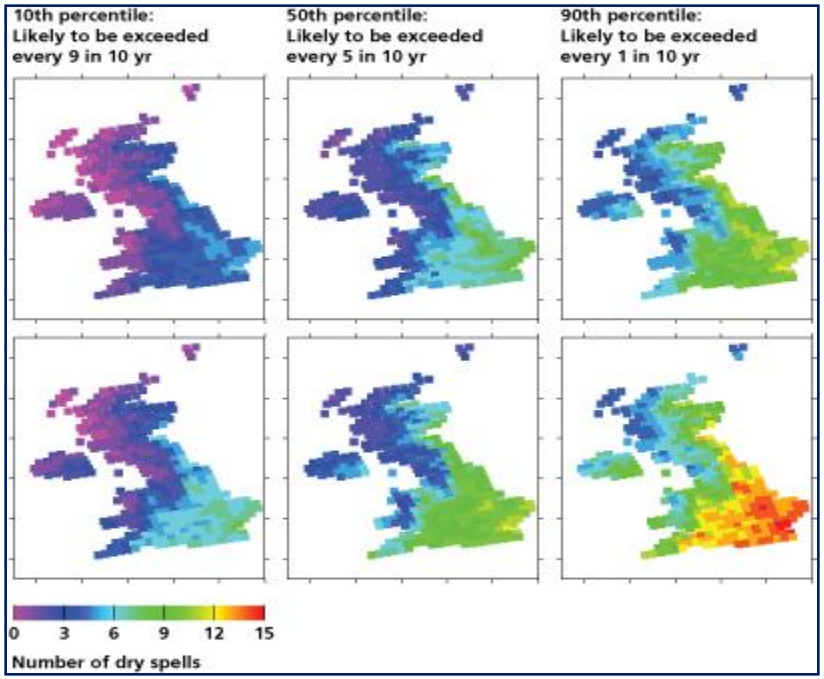
(b) Probability of a complete loss of palsa suitability at different future time periods with the value for 2040-2060 taken from (a) being circled.

London Dry Periods



Numbers of days with precipitation less than 1.0 mm for baseline and for 2050s estimated by the UKCP09 Weather Generator.

Numbers of dry spells longer than 10 days annually estimated by the UKCP09 Weather Generator.



Baseline

2080s
Medium
Emission

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Continuing to Support Users

Extras and Enhancements – based on the existing information and intended to enhance utility and accessibility

- Publication of UK maps of climate change for a change in global temperature **and** maps of probabilities of a given change across the UK.
- Average monthly baseline climate for the UKCP09 administration and river basin regions.
- Improve hourly precipitation extremes in the weather generator
- Improve heatwave simulations in the weather generator.
- Publication of the historical extremes atlas.
- Provide a facility to download larger quantities of data across multiple grid squares, variables and time periods

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Lessons Learned, Challenges and Gaps

Key Lessons Learned

- Information needed is that to support decision and policy making
  - Starting with the decision / policy framing – vulnerabilities, sensitivities
  - More than just descriptions of the current (and future) climate or impacts
  - Adaptation is a decision-making process that requires reflection of uncertainties framed in the context of that process
- Sustained engagement of users and providers of information
  - Aim is informed engagement from concept to delivery and beyond
  - Continuous improvement informed by users' needs and science capabilities
- Both access and support are necessary
  - Defined and delivered working with users and providers
  - Variety of information / knowledge reflecting diversity of users
  - Single snapshots are insufficient – evolving information and support
- Continuous learning and sharing of practice and theory are necessary
- Move from a data (supply)-driven approach to one that is decision (demand) driven informed by science

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Understanding what is needed

Climate information that can be integrated into existing decision making processes and integrated along with other information

- Need to put the organisation's decision-making perspectives centre stage – relevance and enhanced utility
- Descriptions of climate are necessary, but often insufficient
- Recognise that adaptation is a (decision-making) process and that information, including uncertainties, needs to be framed within that process
- Consideration of thresholds, sensitivities and risk tolerances

Information is not enough – needs to be supported with knowledge (e.g., case studies and guidance) and with expertise

Information and expertise need to be credible (legitimacy) – trusted source and with clear articulation of assumptions and limitations

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Understanding what is needed

- Clear, simple and understandable (hierarchical) information – access to what can (should) be used not just what is available
- Different formats (data files, maps, summaries, graphs) consistent with different uses and users' capacities – decision framing and process
- Historical and current climate information
  - Summaries and trends related to thresholds, risks and vulnerabilities
  - Reliable user-defined baseline information on current climate, including extremes, variability and uncertainties
- Future climate information
  - Next 10 years and less, next 20-50 years and the next 50-100 years
  - Variability and extremes, along with uncertainties
  - End-user defined variables and derived metrics (thresholds and sensitivities)
- Different temporal and spatial scales – local to regional, but also access to global

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Challenges and Gaps

Climate information must be accessible and useable by the target users

- Challenge is striking an appropriate balance between acknowledging the complexity and providing information to support decisions – balancing robustness with utility

Accessibility should consider:

- Capacity, time available and motivation / inclination to use the provided information
- When the information / knowledge is needed
- Capacity to access information (Internet, publications, etc.)
- Evolving historical data and climate science – new information and multiple sources
- Need for and capacity to support access
- Degree to information and knowledge is freely available relative to bespoke (available for a fee)

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Challenges and Gaps

Uncertainty – exists and is an essential part of decision making

- Deterministic information – brittle adaptation
- Is optimal or 'worse case' adaptation appropriate considering uncertainties?
- Desire for single set of information
  - Costs in terms of time and capacity
  - Interpretation of outputs?
  - Easier to use

Does this result in an 'valid ' decision

Who owns the remaining risks?

An alternative approach – starting with the decision and not the climate

- Framing decisions in terms of costs, risks and uncertainties of different options rather than simply in terms of the different climate projections

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Challenges and Gaps

Evolving climate (and non-climate) information

- Climate observations – new climate data, information on trends, normals (1961-90, 1971-2000, 1981-2010, etc.)
- Climate scenarios/projections – new and updated scenarios from a variety of different sources – are periodic snapshots enough?

Challenges

- Incorporating new information as and when it comes available / is needed
- Knowledge exchange – a two-way process
- Evolving adaptation decision-making process and framing

Providing climate information capable of being integrated with non-climate information

- Myriad of non-climate data and information used in making decisions
- Socio-economic and land use data and scenarios (e.g., national annual population, economic, water supply and demand and land use)

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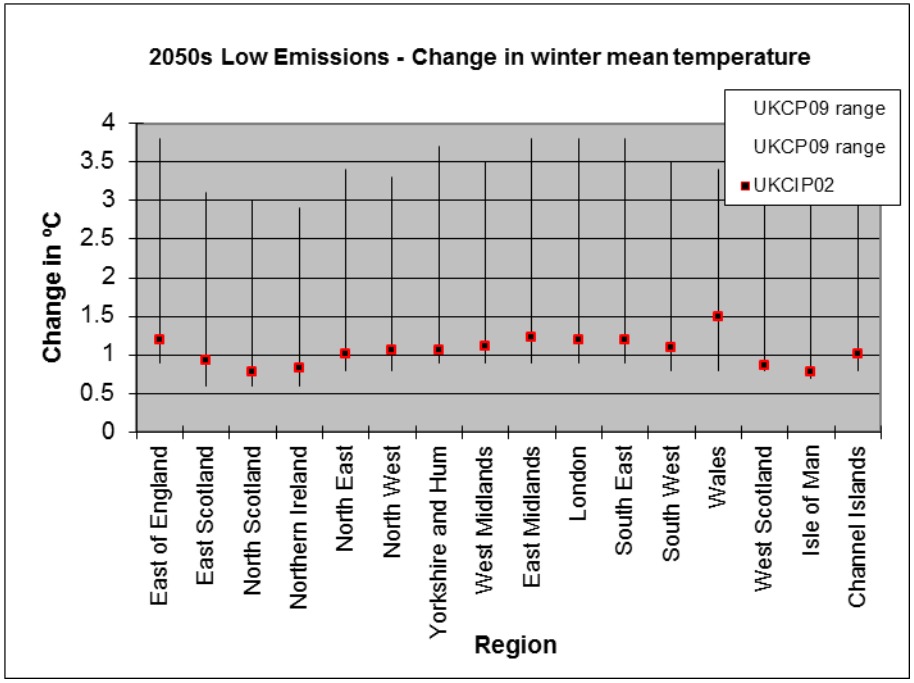
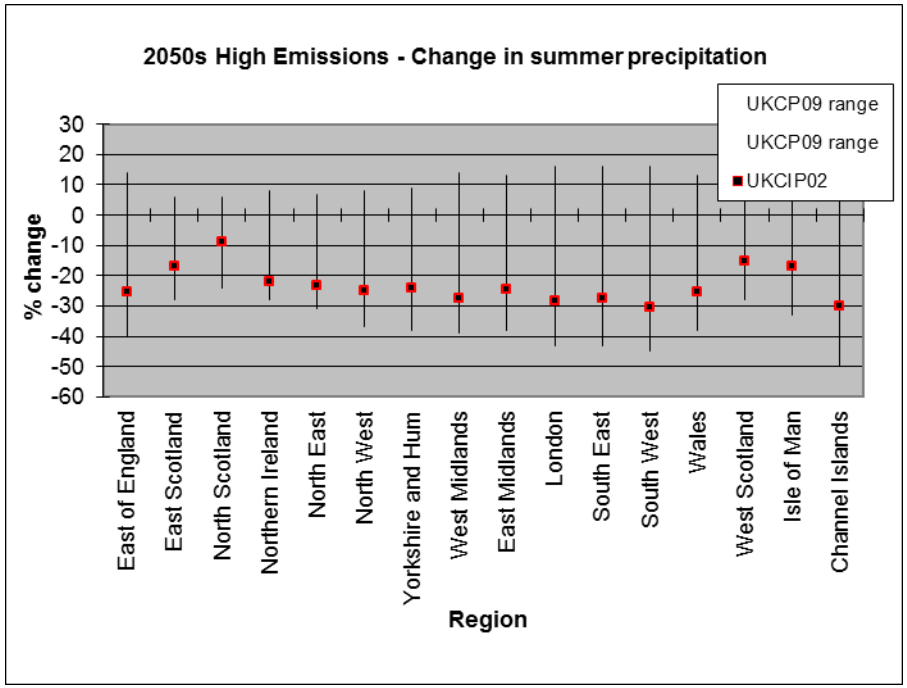
Comparisons UKCIP02 and UKCP09





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Climate Service Science – Supporting moving forward

Climate Information to Support Decisions

Going Forward – 'Climate Service Science'

- Representatives of users, producers and purveyors of climate information, including representation of the climate impacts, risks and adaptation research community were brought to explore the nature and scope of climate services and the research and other activities that are needed to develop and deliver credible and relevant climate services.

Climate Service Science

- Science required to **generate and communicate knowledge and practices** to support development and provision / delivery of climate services (utility (relevance) of climate information and knowledge; accessibility; knowledge exchange; and mechanism and structures needed to support climate services)
- Does not include fundamental climate science, climate impacts, vulnerability and risk research, or assessment of the accuracy of climate predictions

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Information and Support Gaps

- Means of **supporting users' coordination** to enhance their engagement and mechanisms to support engagement (users, providers and purveyors networks)
- **Demonstration projects/activities to enhance engagement** and demonstrate how climate services can be used to inform decision-making
- Development and dissemination of **good practice guidance**
- **Learning** from communication and decision-making science
- **Cross-council climate service research and funding** reflecting its interdisciplinary nature
- Mechanisms to support **development of skills needed** to work in interdisciplinary and multi-sector space
- Including in the research the requirement for **identifying and realising pathways to impacts** with end-user engagement in research and dissemination
- **Registries of climate services** activities, results, portfolios and quality

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Research Community Ambitions

- **Users' decision spaces** (sectors where needs are greater, where are vulnerabilities / risks high, drivers of concern, risk appetite and timeframes for decisions/ policies)
- How climate information fits into users' **decision-making processes**
- **Valuing of climate services** and the need and potential for establishing **standards**
- Where users **currently access** climate services
- Nature and scope of **current and future users' needs** (foresight)
- Users' current and changing **technical capacity to ingest** climate services
- **Capacity (including funds) and willingness to be engaged** in developing and delivery of climate services and in climate services science
- **Breadth of users** those engaged actually represent and how better to engage the spectrum of users
- In delivering these, a multi-disciplinary approach to climate services science has been identified as essential.

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Structures and Mechanisms to Support

- An **interdisciplinary research programme** supporting development and delivery of climate services, including the support of research funders, research coordination, engaged users and research community, and sufficient funding to be seen as viable.
- Targeted **demonstration projects –** end-to-end value of climate services
- A **service delivery approach** to the provision of climate services that includes targeted engagement of users, purveyors and providers of climate information with an appropriate public good-bespoke balance and quality assurance of climate services.
- An **'open-access' information hub / knowledge management platform**, including mapping of current networks (projects and groups) delivering climate services and related science, and information on users' needs.

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Structures and Mechanisms to Support

- Climate services to support national/regional risk assessments and adaptation strategies
- **Enhancing users' capacity** to understand, access and use climate services, including accredited training courses (initial scoping study and issue a call for requirement capture and demonstration delivery
- A **practice culture or regulatory environment** that encourages / requires consideration of weather and climate risks in decisions. Involvement of regulators, professional bodies, trade organisation, policy makers and economists with a possible pilot within a particular sector

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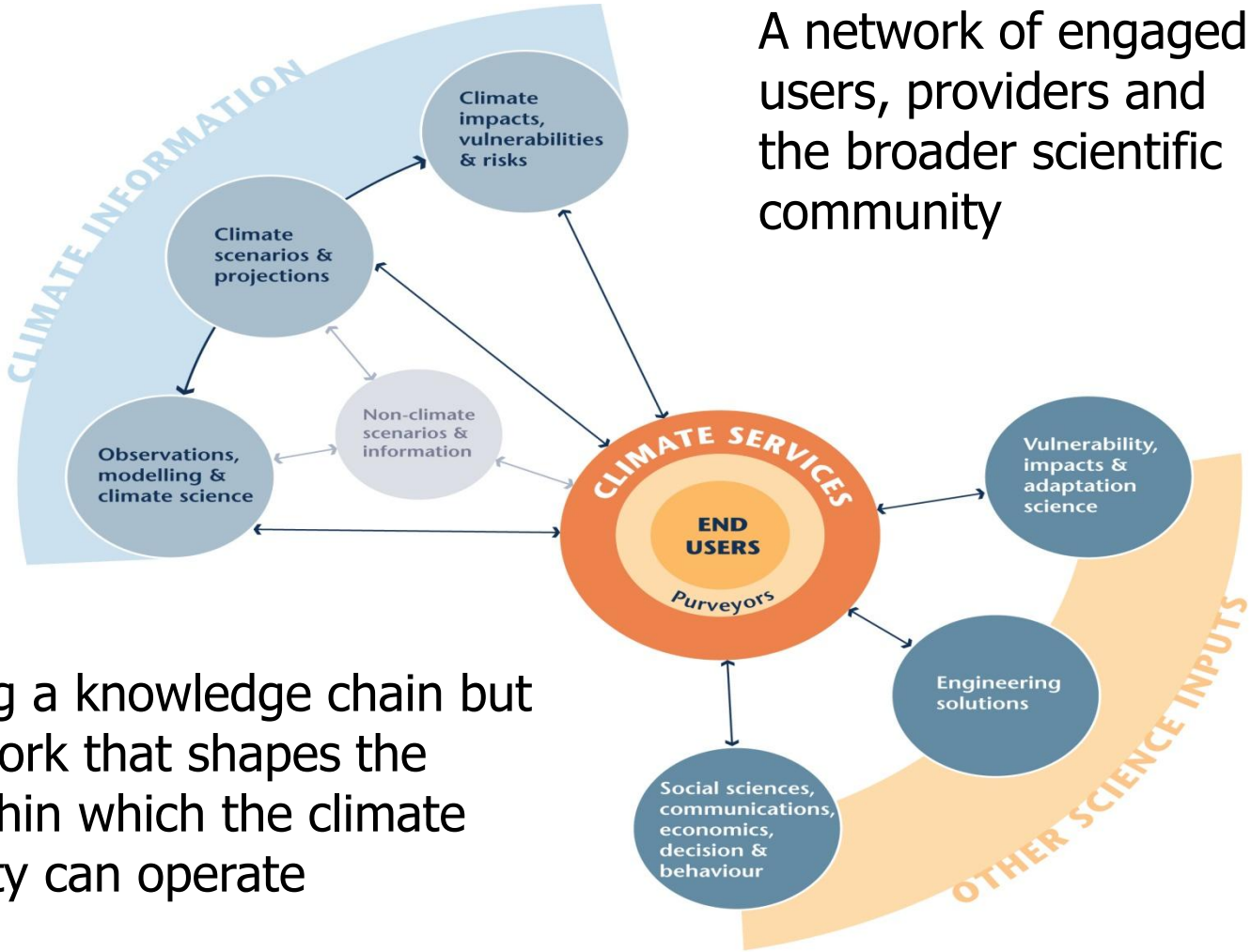
Climate Services – A knowledge network

Climate information and the knowledge to inform decision making and processes



A network of engaged users, providers and the broader scientific community

Not simply building a knowledge chain but a knowledge network that shapes the decision space within which the climate services community can operate

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http://www.ukcip.org.uk/