

Impacts of climate change on our water resources

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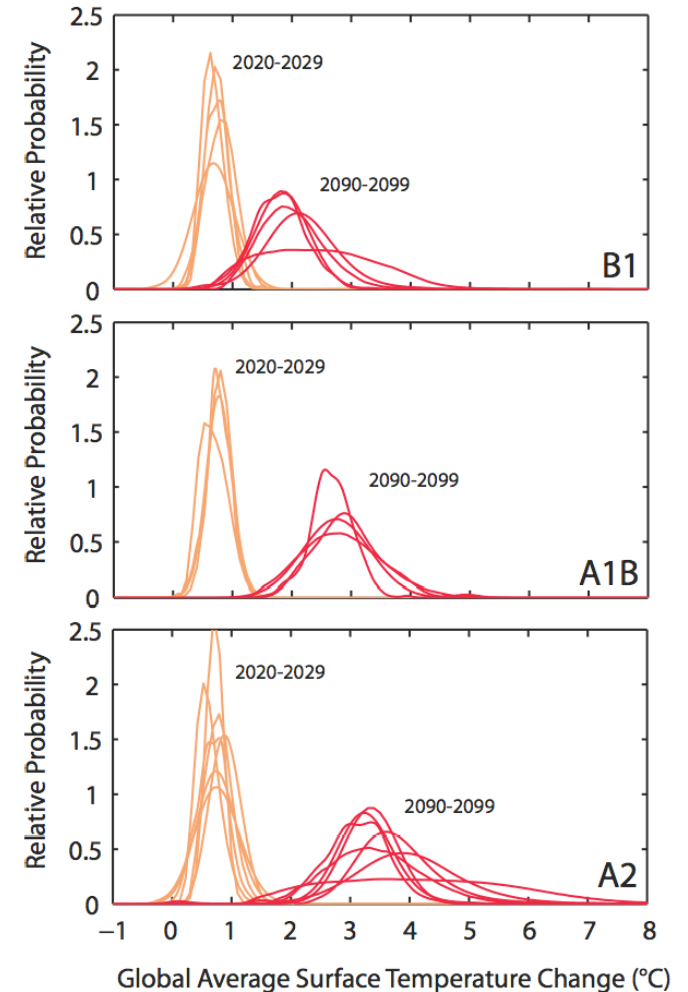
Outline

- A changing climate
- Implications for river flows and recharge
- Implications for water management

Changing climate

IPCC AR4 (2007):

- Global increase in CO₂ concentrations are primarily due to fossil fuel use and land use change
- Warming is now “unequivocal”, with very high confidence it is due to human activity
- Warming will continue at about 0.2°C/decade for the next few decades – depending on emissions



Changing UK climate

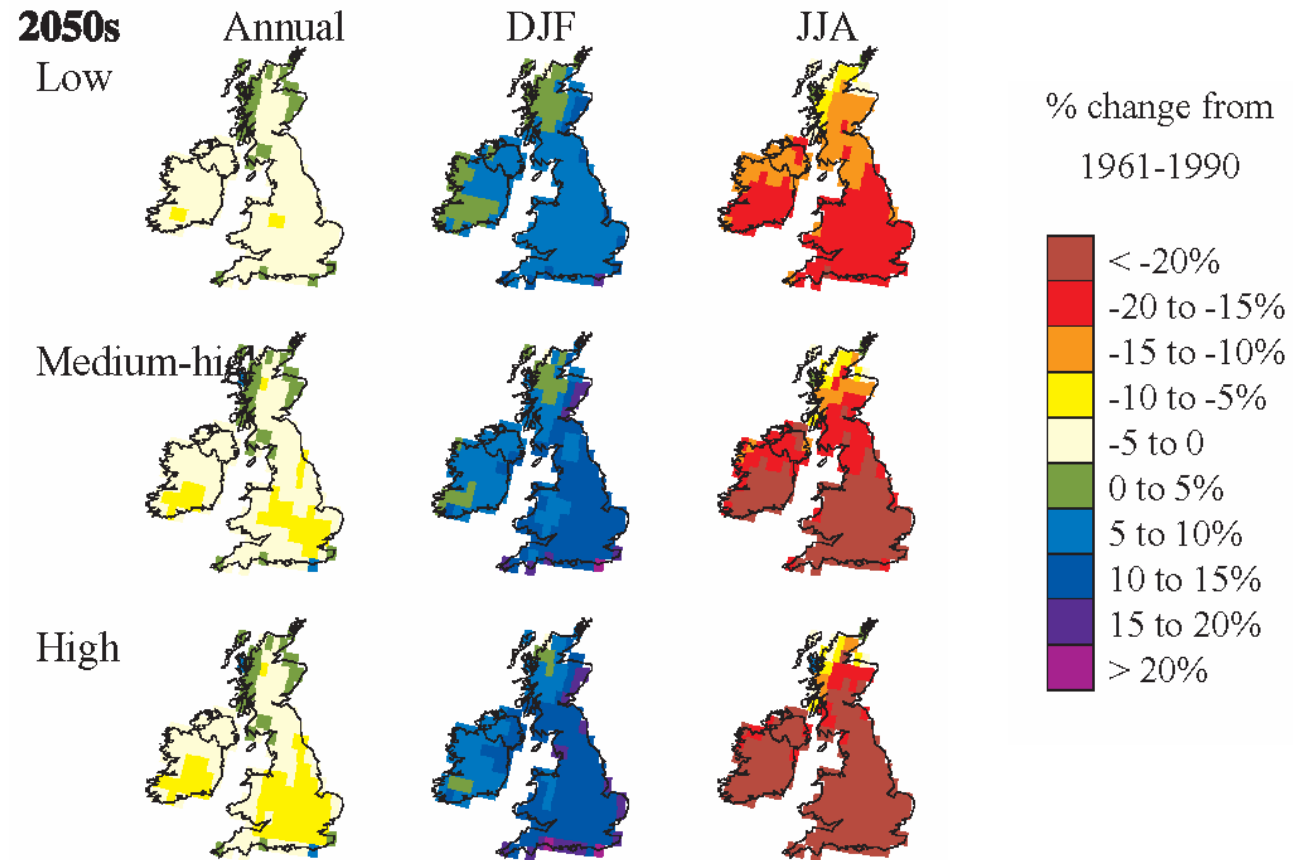
UKCIP02

- **4 emissions scenarios**

	increase on 1961-1990 (°C)	
	by 2020s	by 2050s
low	0.79	1.41
medium-low	0.88	1.64
medium-high	0.88	1.87
high	0.94	2.24

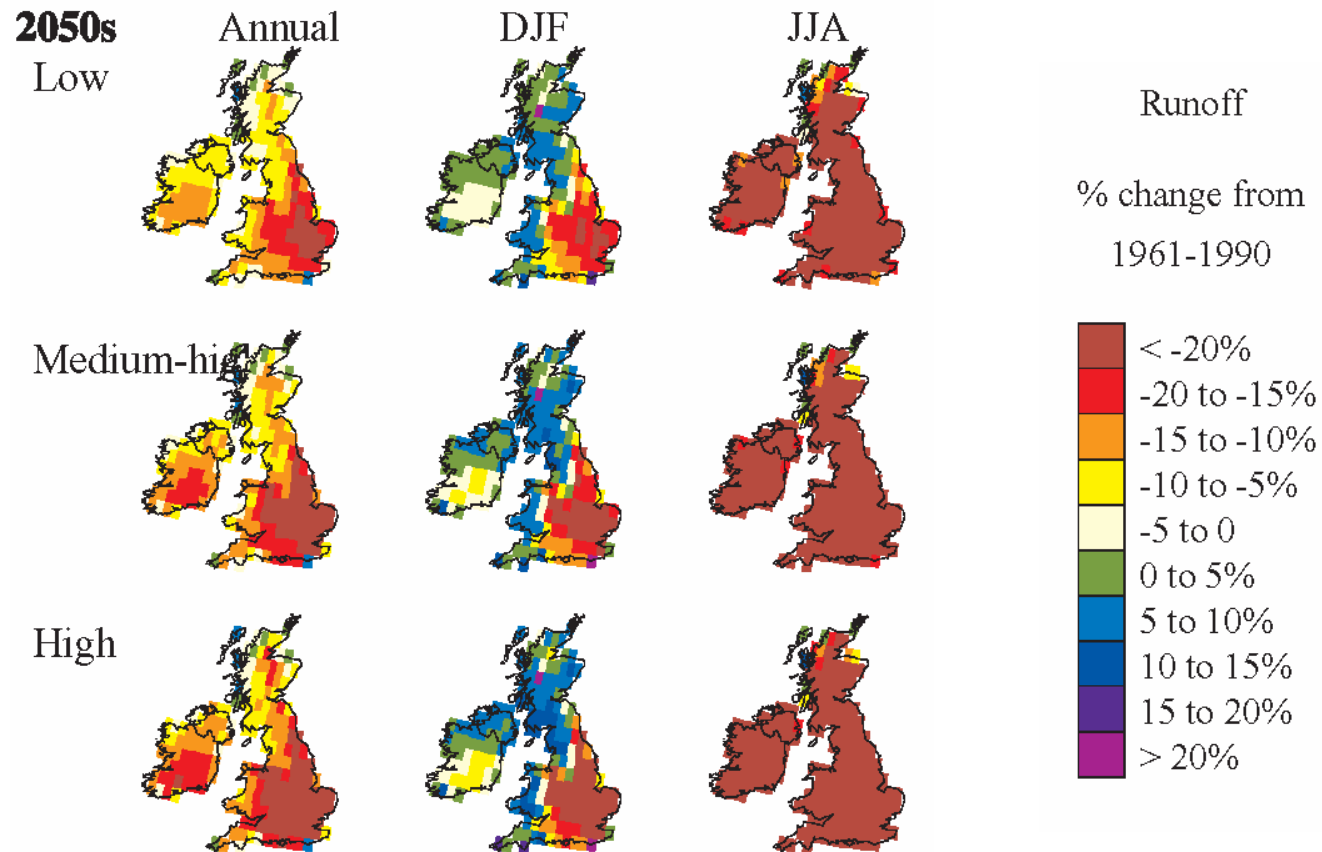
Changing UK climate

Rainfall change by the 2050s

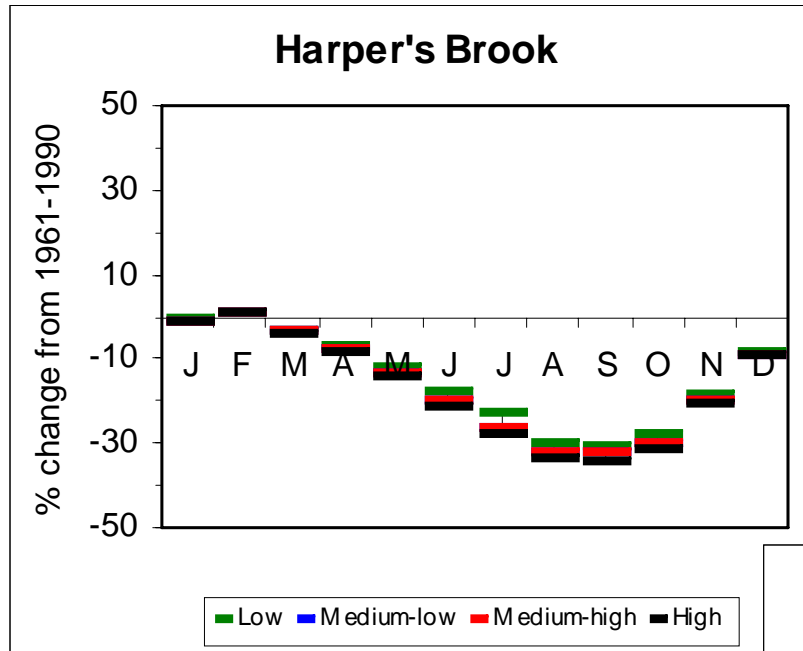


Implications for river flows

Runoff change by the 2050s



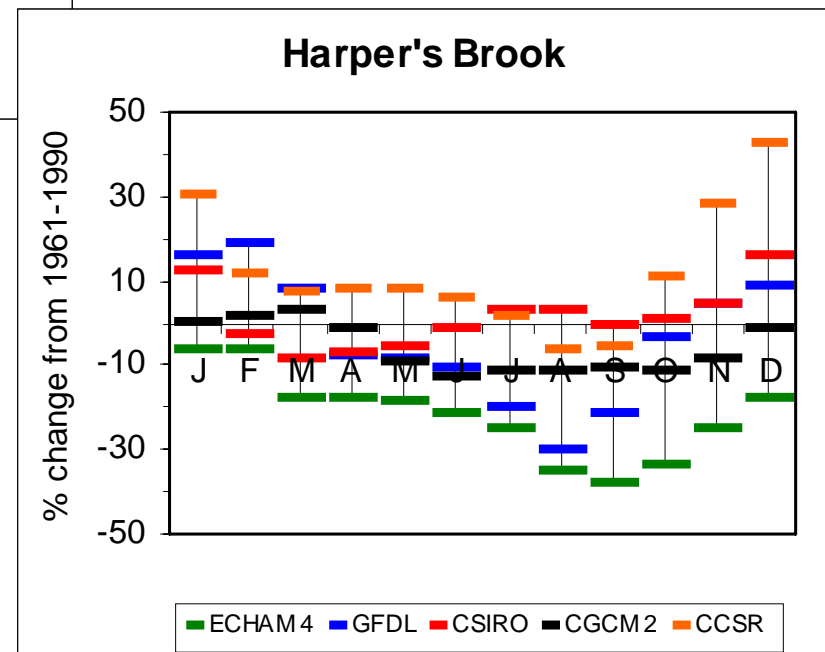
Implications for river flows



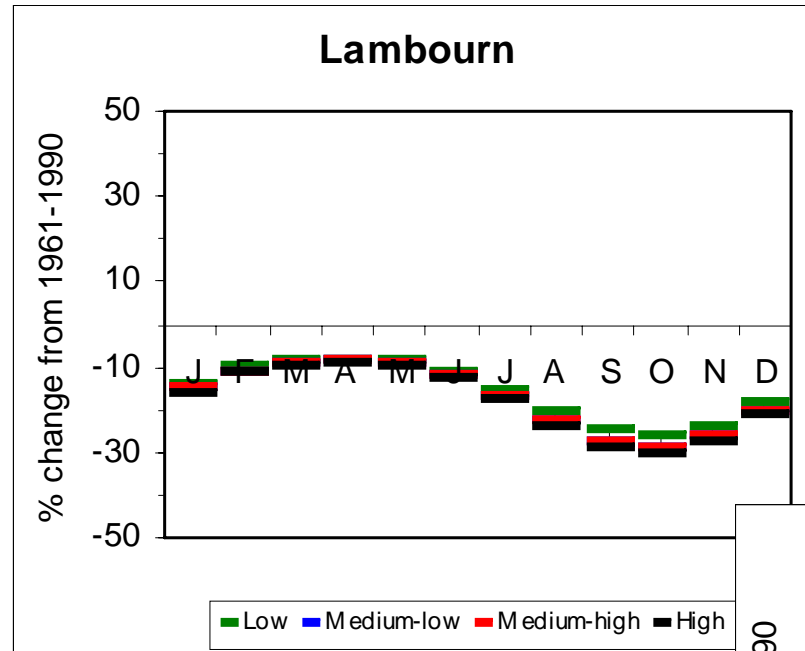
Change by the 2020s
UKCIP02 scenarios

Eastern England

Change by the 2020s
...other scenarios

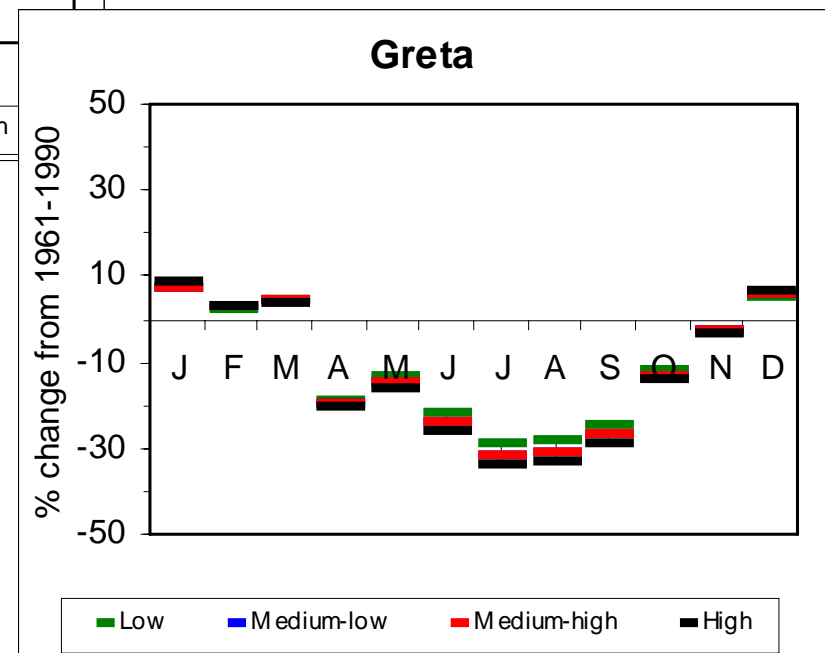


Implications for river flows



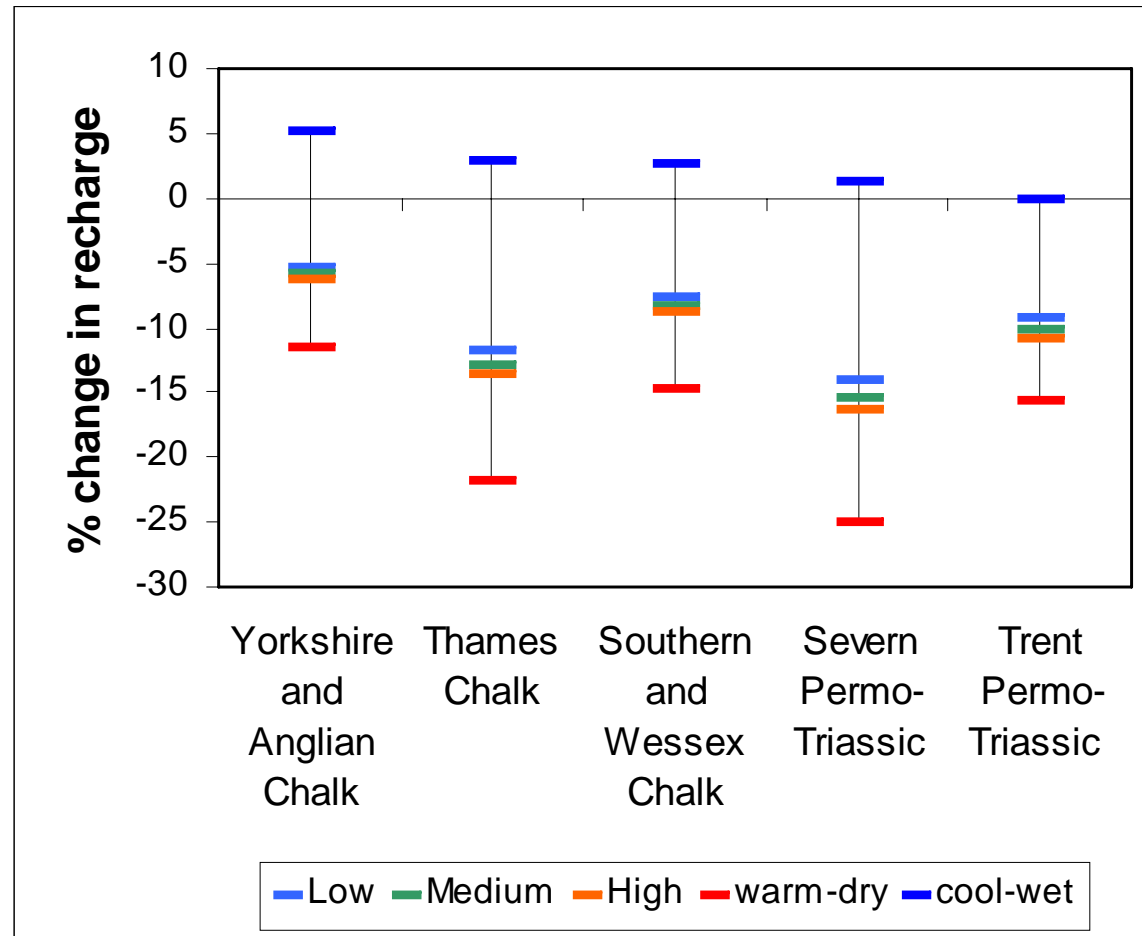
A chalky river

An upland river



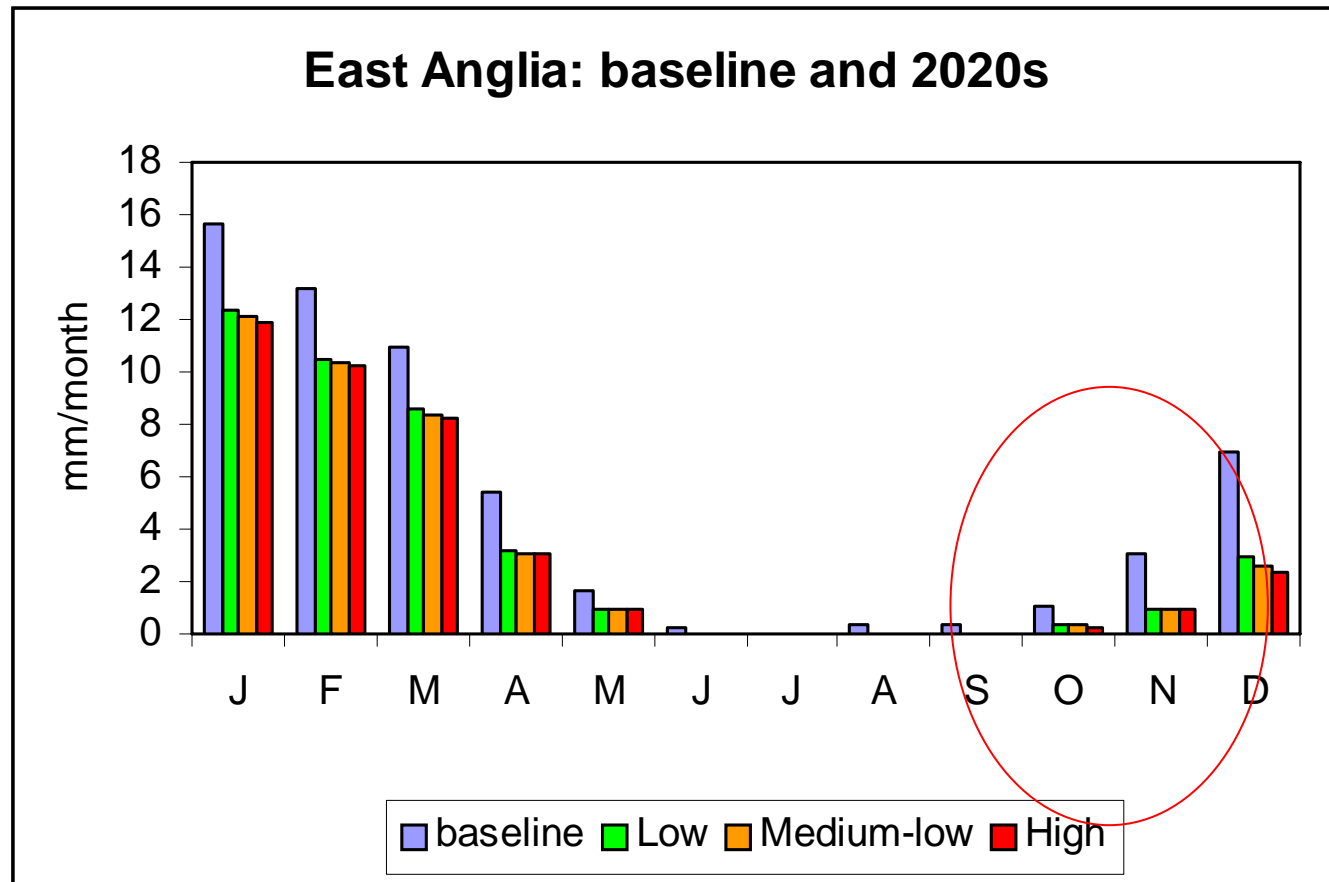
Implications for recharge

Change in average recharge by the 2020s

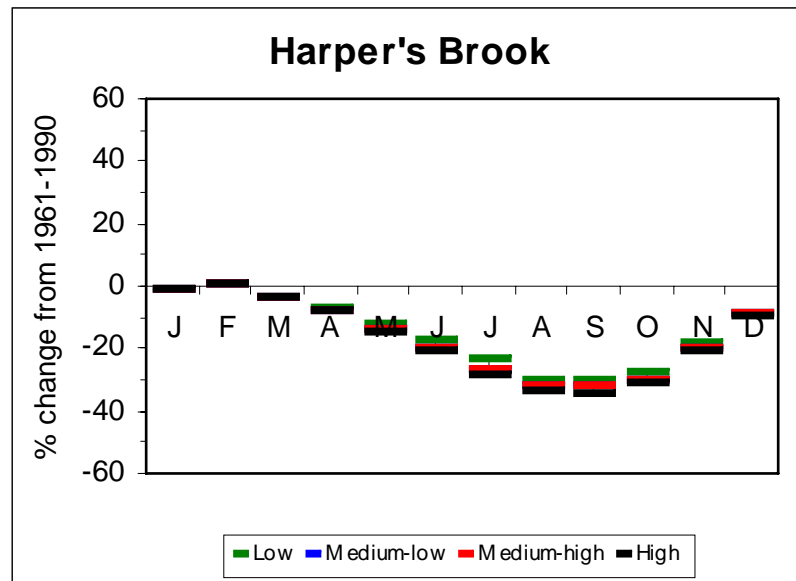


Implications for recharge

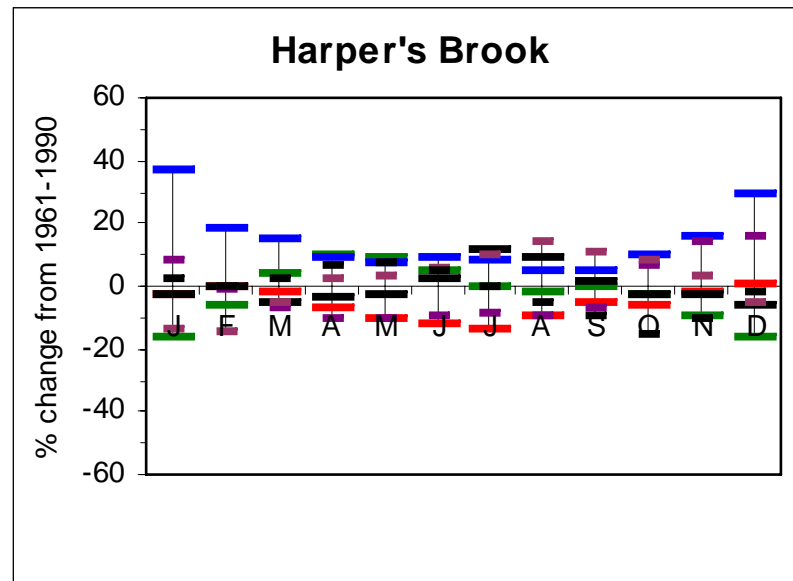
Change in monthly recharge by the 2020s



Climate change and climatic variability



2020s, UKCIP02 scenarios



Multi-decadal variability

Hydrological impacts

Impacts of climate change on river flows and recharge are substantial

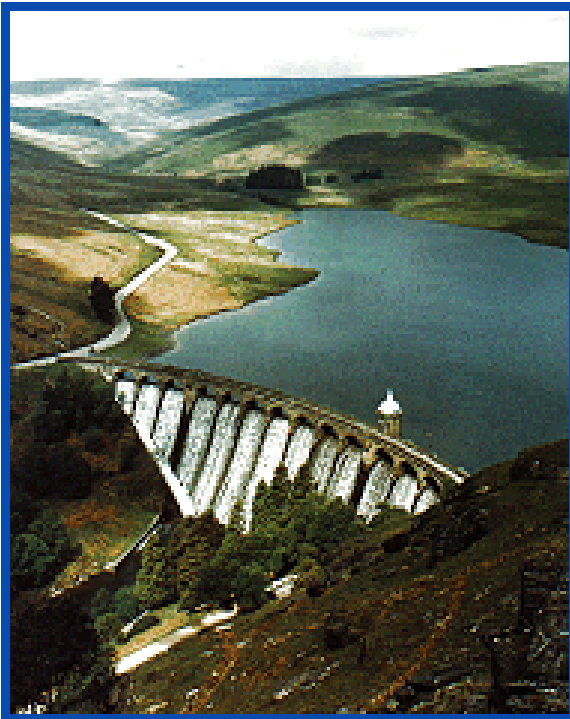
Impacts are difficult to quantify

Natural multi-decadal variability may hide or exaggerate climate change

Specific water resources impacts...

Severn-Trent

6.5% reduction by 2025



Thames / London

11-13% reduction by 2025



Implications for water resources

Resources are under pressure *without* climate change

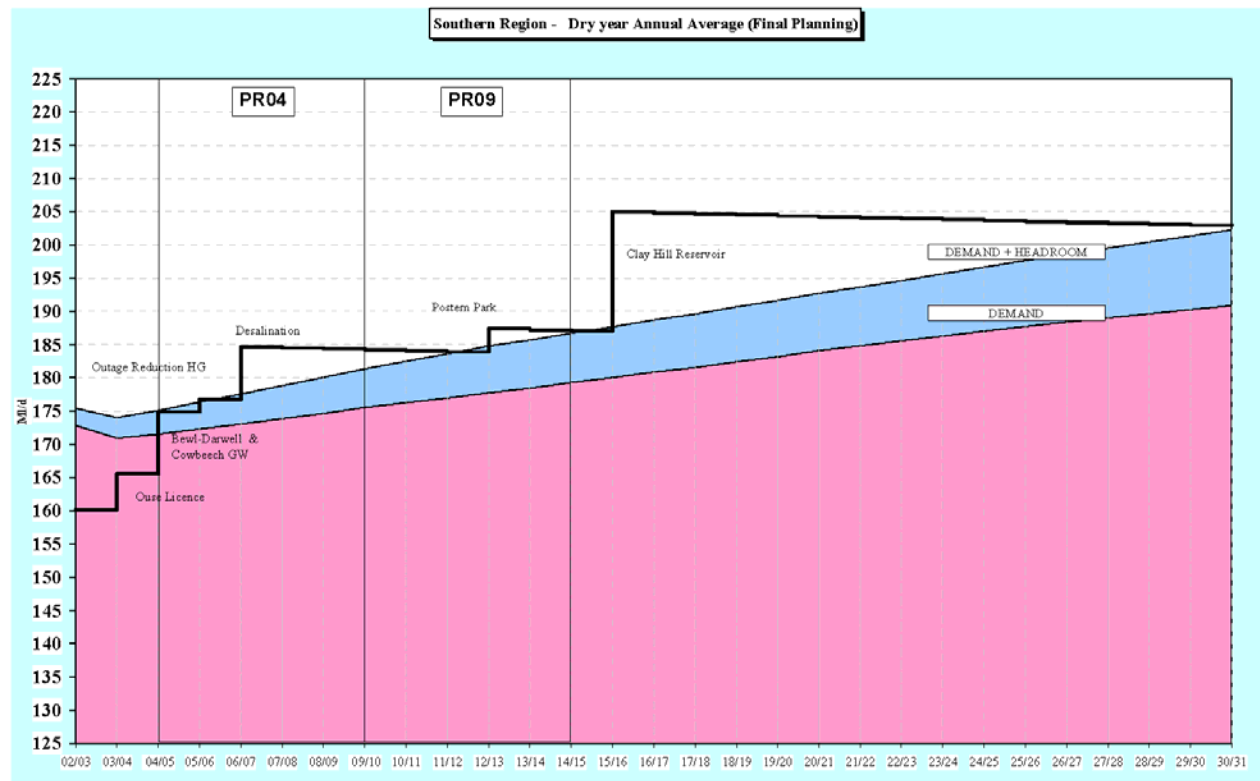
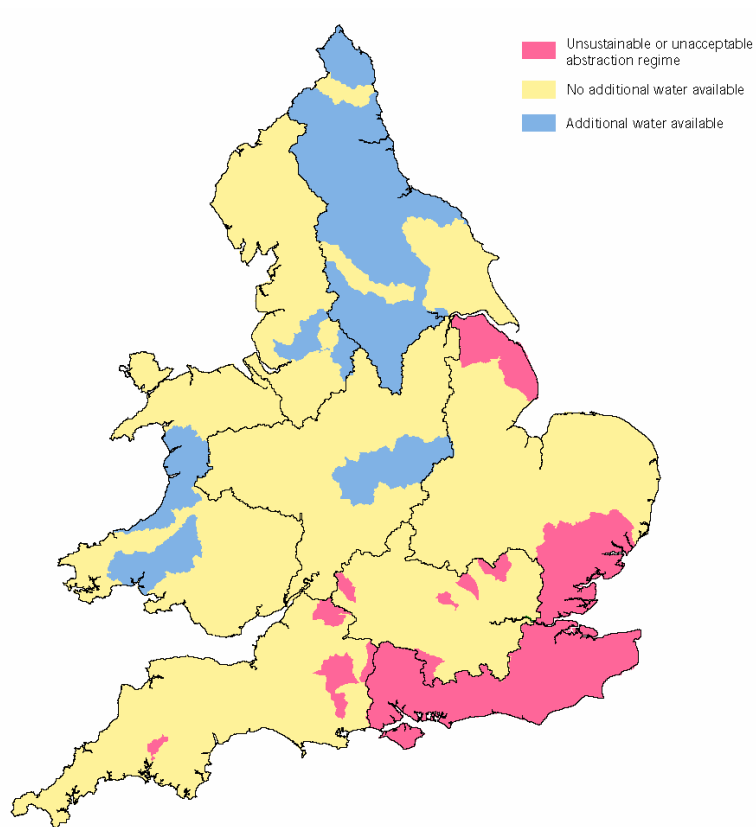


Figure 3 Supply Demand Balance Southern Region (Dry Year Annual Average, Final Planning)

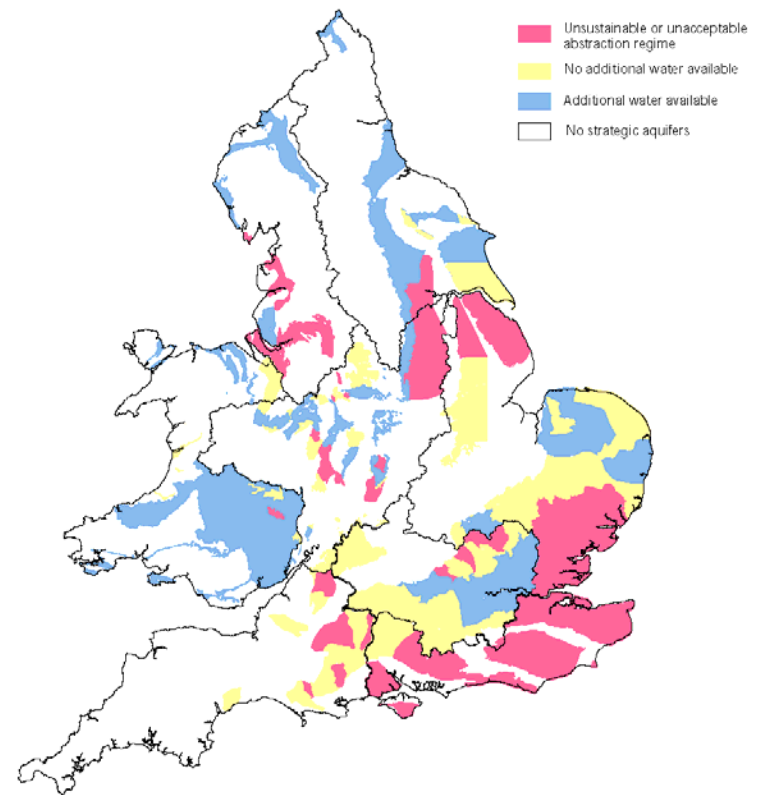
South East Water Southern Region

Implications for water resources management

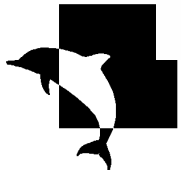
Assessments of current availability



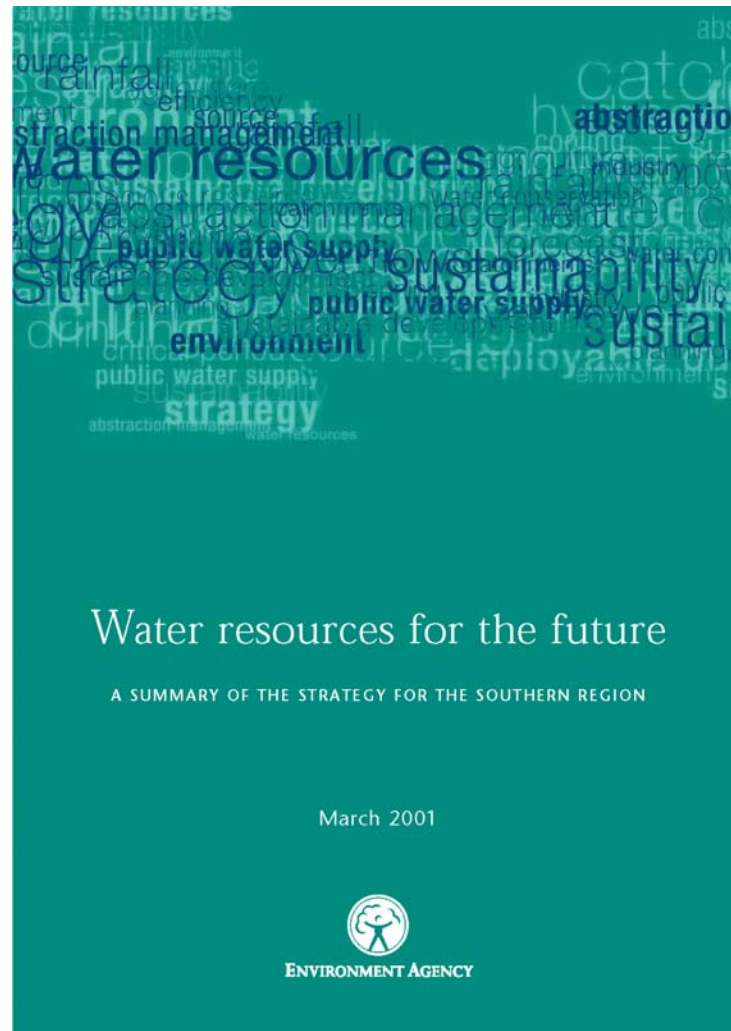
Summer surface water



Groundwater



Implications for water resources management



**Regional
water
resources
strategies**

**25-year
horizon**

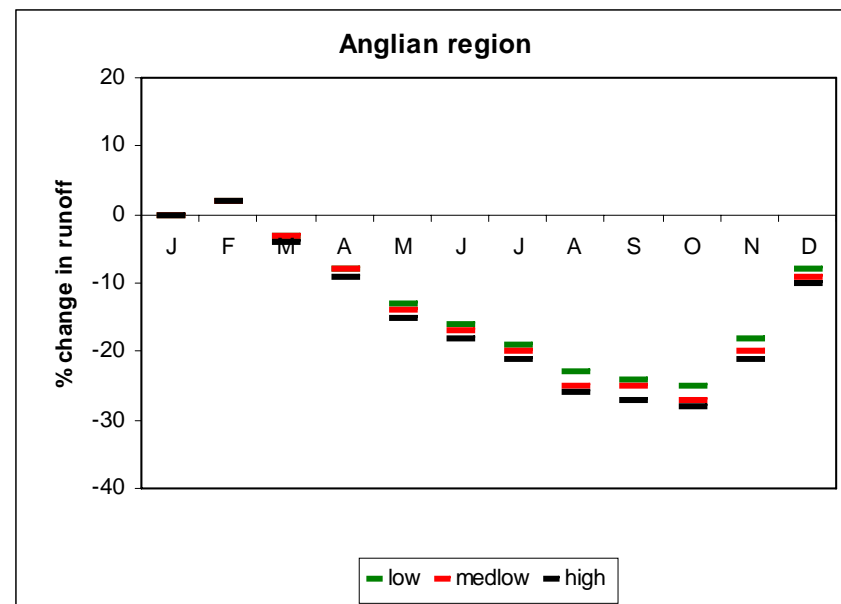
*These need to
take climate
change into
account*

Implications for water resources management

Company resource plans

These need to take climate change into account

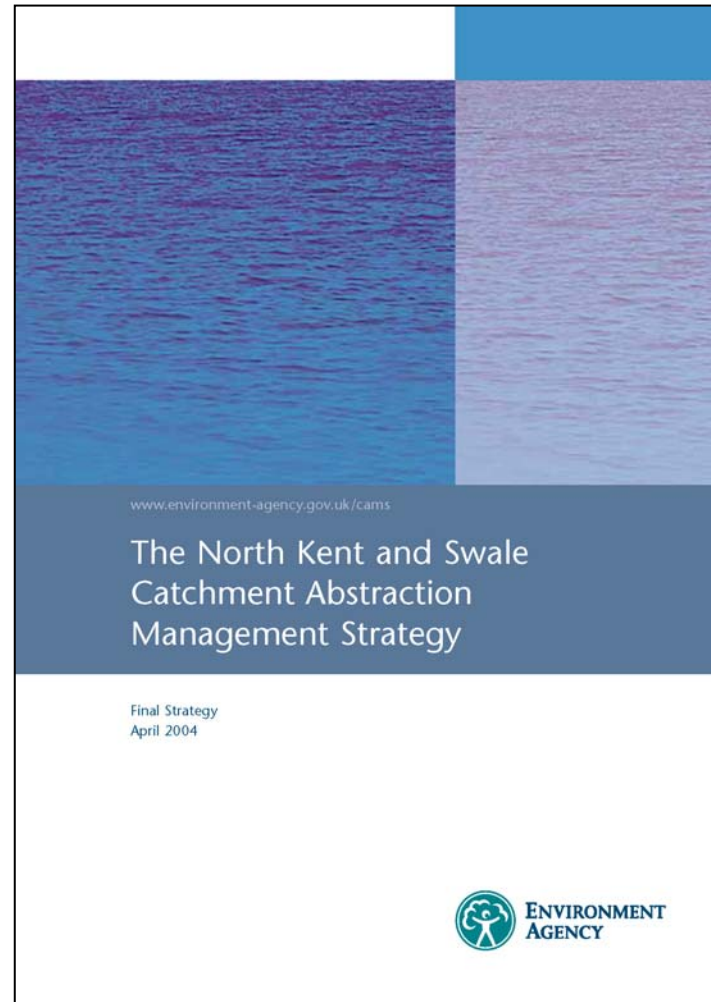
Specific guidance on methodologies needed from the regulators



Implications for water resources management

Catchment Abstraction Management Strategies

5-10 year horizon



Implications for water resources management

Catchment Abstraction Management Strategies

2010

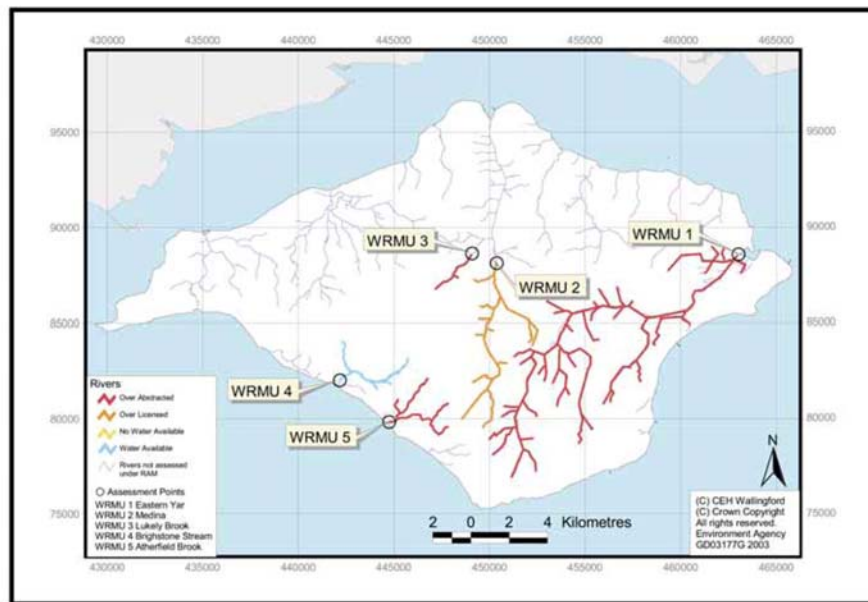
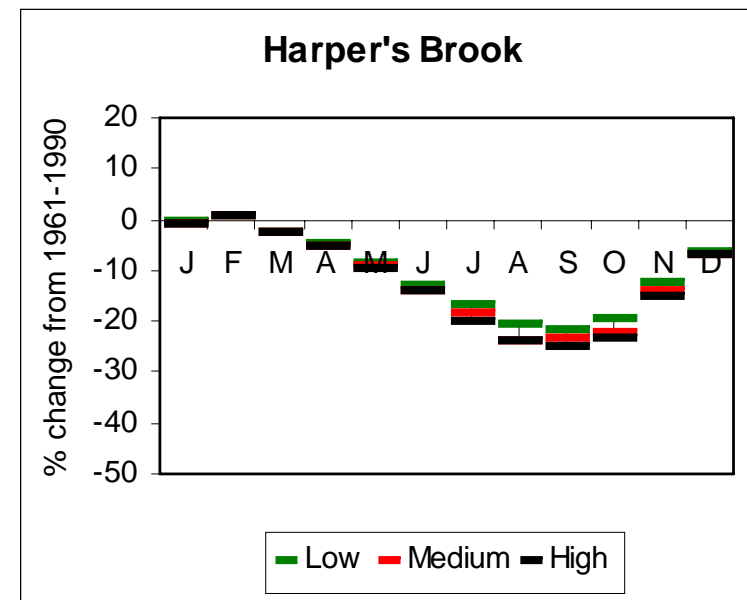


Figure 8 - Water Resource Management Units (Surface Water)



Are abstraction strategies agreed now sustainable over the medium term?

How does climate change affect benchmark flows over the short/medium term?

Implications for water resources management

We need to incorporate projections of climate change into regional water resources strategies

We need to consider whether catchment abstraction management strategies are robust and sustainable

Implications for adaptation..

We will never be able to predict precisely the impacts of climate change on a system

Most systems are exposed to multiple stresses

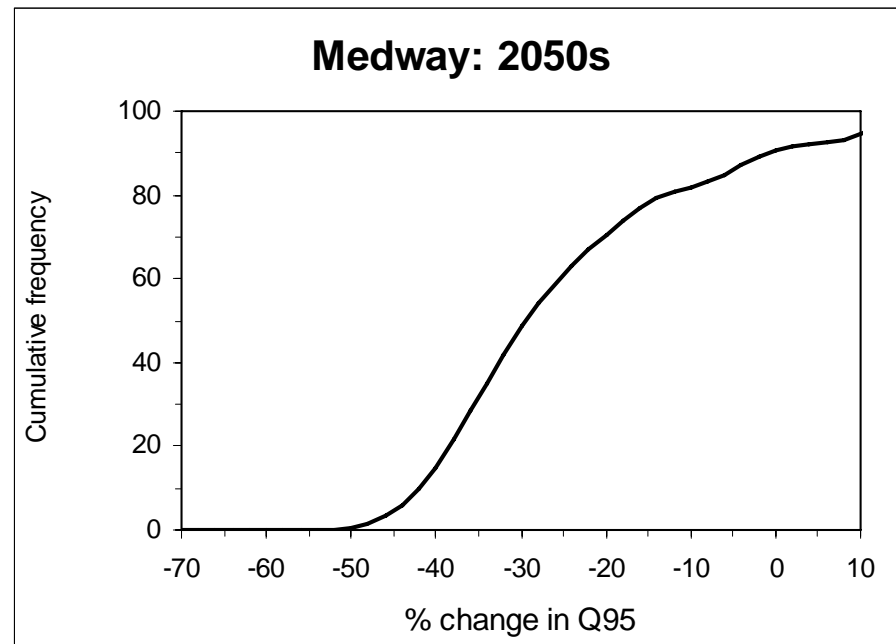
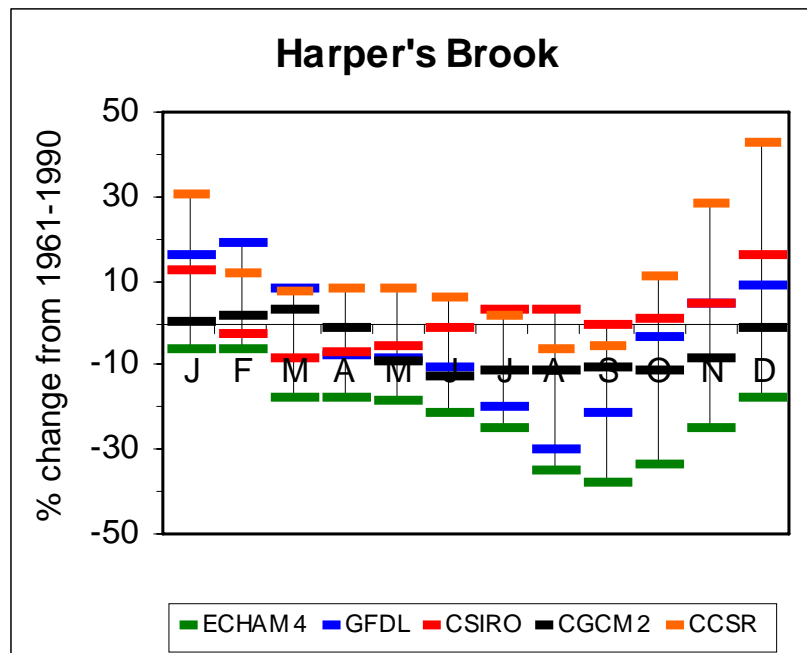
Defer decision...

Adopt a risk-based approach
to design / strategy selection

Implement robust approaches
to reduce vulnerability to
impact

Risk-based approaches

Use multiple scenarios to characterise likelihoods of defined outcomes



Multiple scenarios representing all possible combinations of outcomes

Robust adaptation

Capacity-building *and* specific actions

Capacity-building

- conceptual change
- development of procedures / tools
- development of intellectual capacity

Specific actions

- identify win-win / no-regrets actions
(enhance ability to recover, improved seasonal forecasting etc...)

What happened in the last periodic review?

Climate change was combined with other drivers of change – particularly demand

Climate change alone did not trigger investment decisions – but did contribute

Water company preference for resource schemes;
Environment Agency preference for demand-side schemes

Conflict??

Barriers to adaptation

Physical

- can we physically adapt?

Financial

- can we afford it?

Feasibility

- is it socially or politically acceptable?

Capacity

- do we have the institutional capacity / methodologies to adapt?