How should evidence inform operational decisions in an uncertain world

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THE
VINE

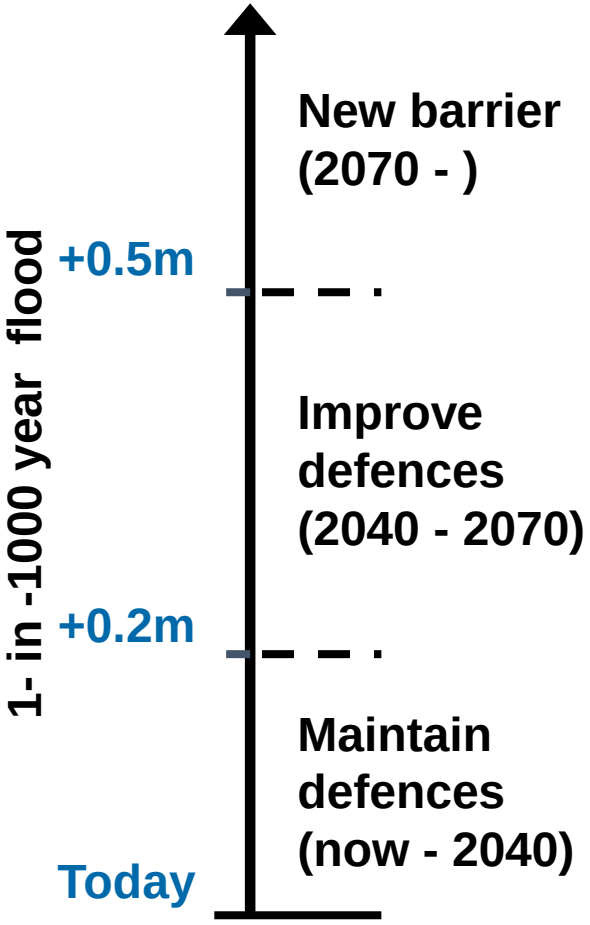
Communicating about risks can be tricky

Cheltenham 2006
£22m flood risk management scheme completed

Cheltenham 2007

5%	**10%**	**22%**
5yrs	10yrs	25yrs

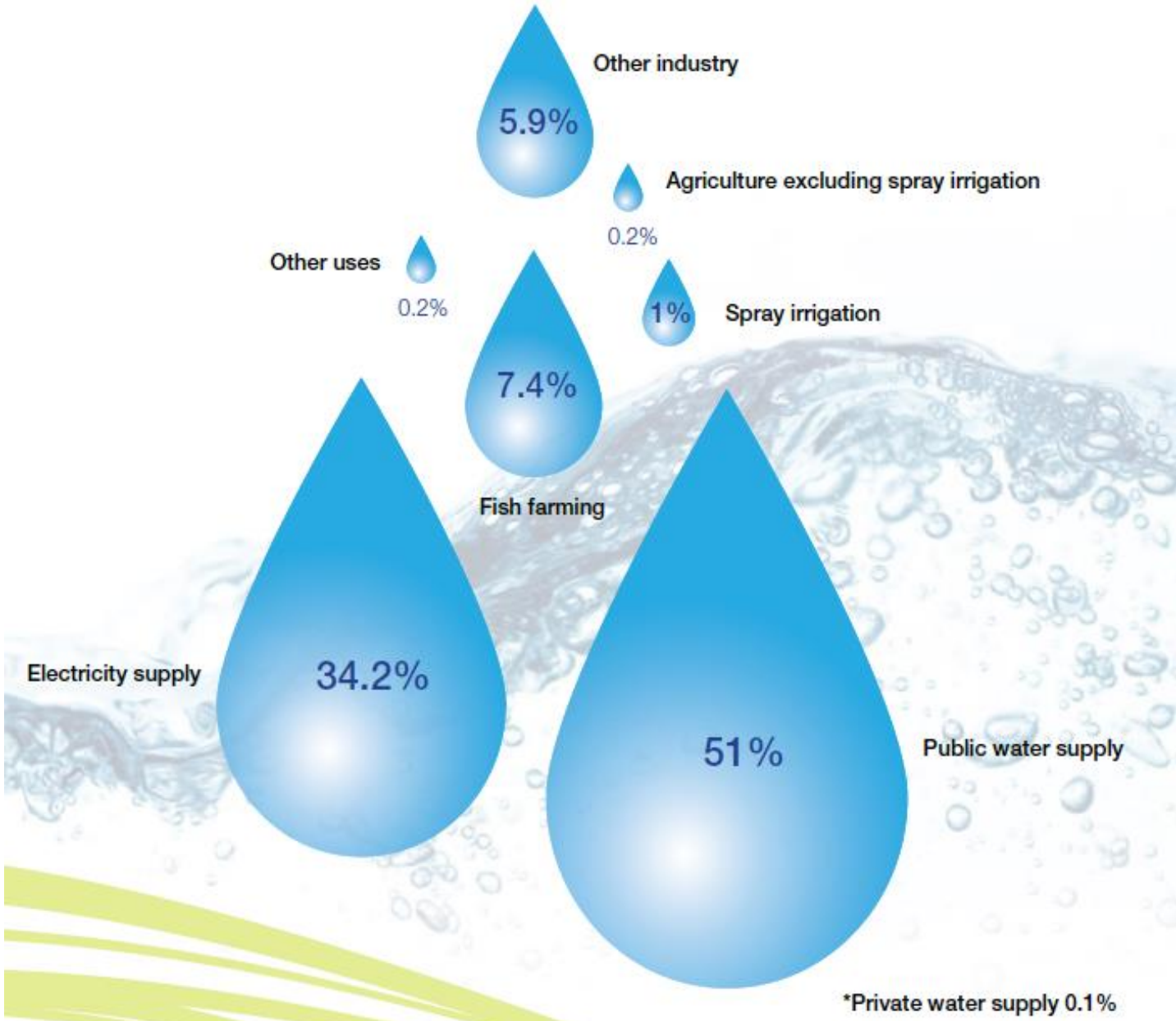
Thames Estuary: using scenarios and a managed adaptive approach



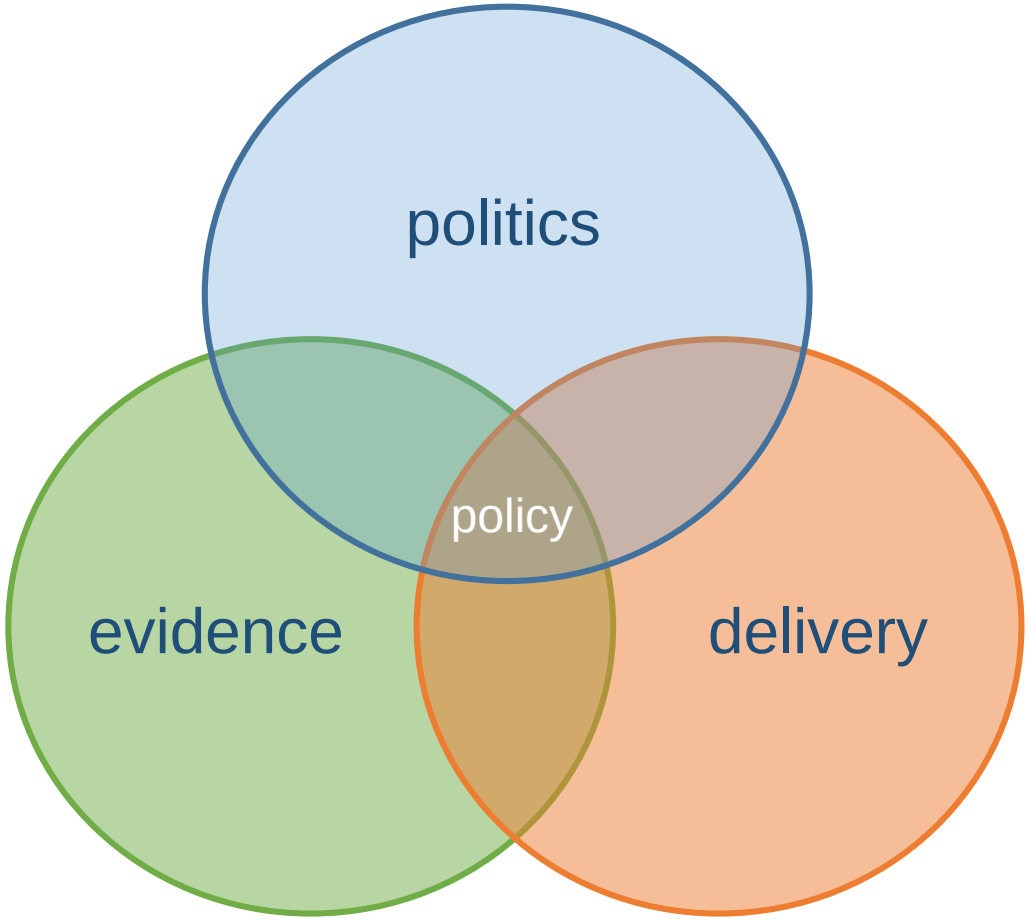
Focus on outcomes

- Sufficient water of the right quality for:
  - people
  - agriculture
  - businesses
  - the environment
- Everyone wants water when it is in short supply

The main uses of water England and Wales

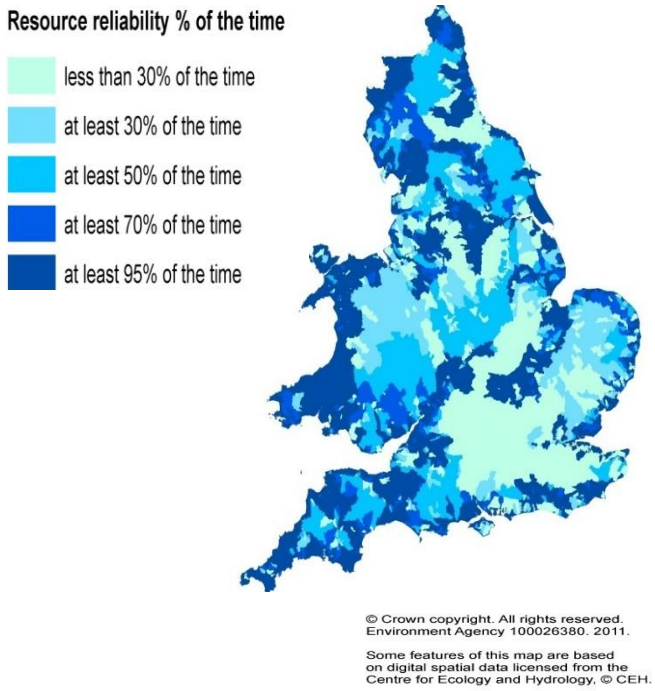


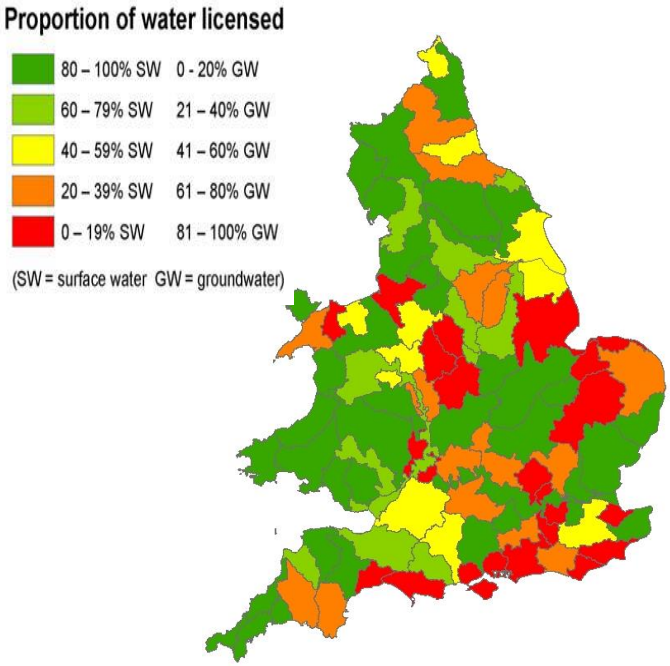
Understanding the context



Water resource pressures England 2015

- 11% of surface water body flows insufficient for a healthy ecology
- 30% of groundwater bodies not achieving good quantitative status
- Since 2008, 27 million cubic metres of water per year returned to environment by restricting abstractions
- Continuing review of abstraction licences
- Some licences granted when there was poorer understanding of the impact of over-abstraction on the environment:
  - drying out of rivers
  - falling water tables
  - intrusion of saltwater in coastal areas



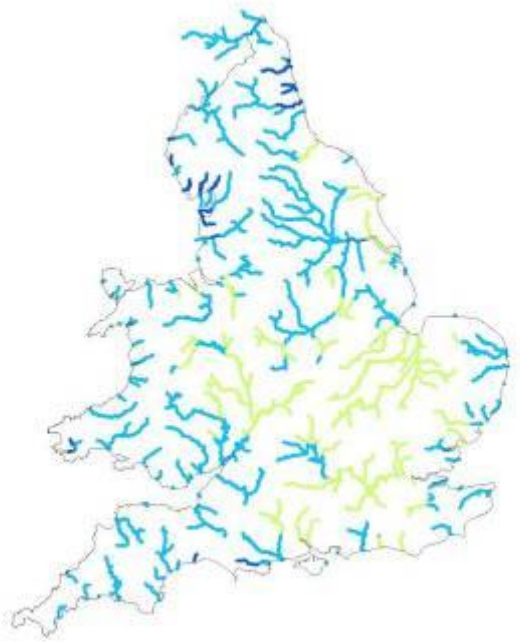


Water resources planning criteria

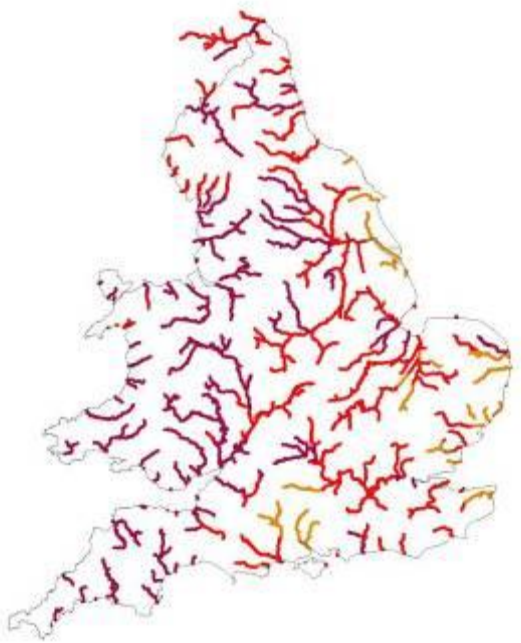
- Climate change
- Population increase
- Economic growth
- Need to reduce abstractions to protect the aquatic environment
- Catchment based approaches
- The risk that future droughts may be worse than the historic droughts against which companies plan
- Companies plan to differing levels of service and drought severity
- No consistent view of resilience
- Relationship between quantity and quality aspects
- Drainage and sewer capacity
- Clear conceptual models to aid public engagement

Future pressures – changes in river flow 2050

February



September



- Overall decrease in river flows
- Greatest decreases in summer and on hard rock catchments
- Could be 50 to 80% lower than today

Adapting to changing conditions in water supply planning

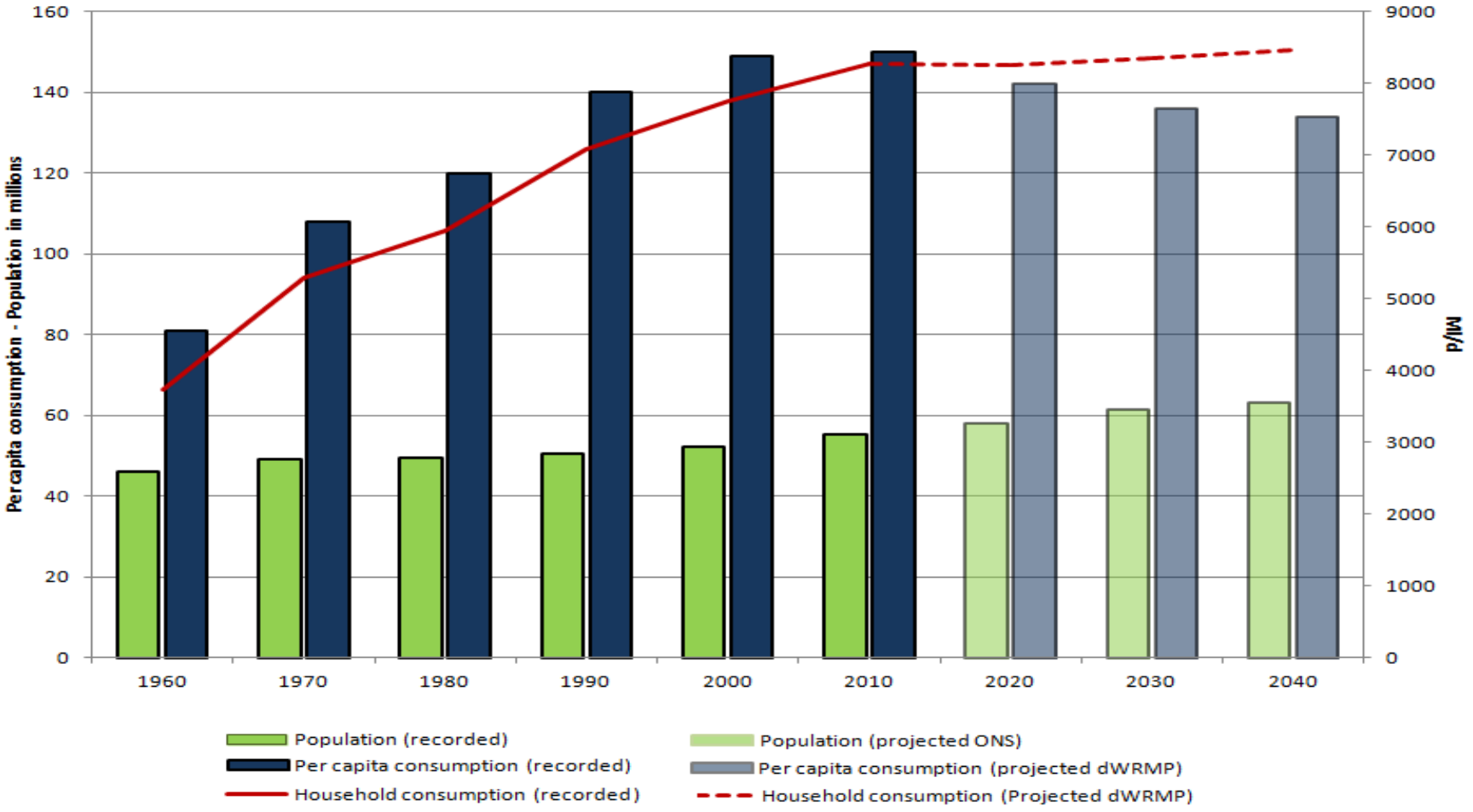
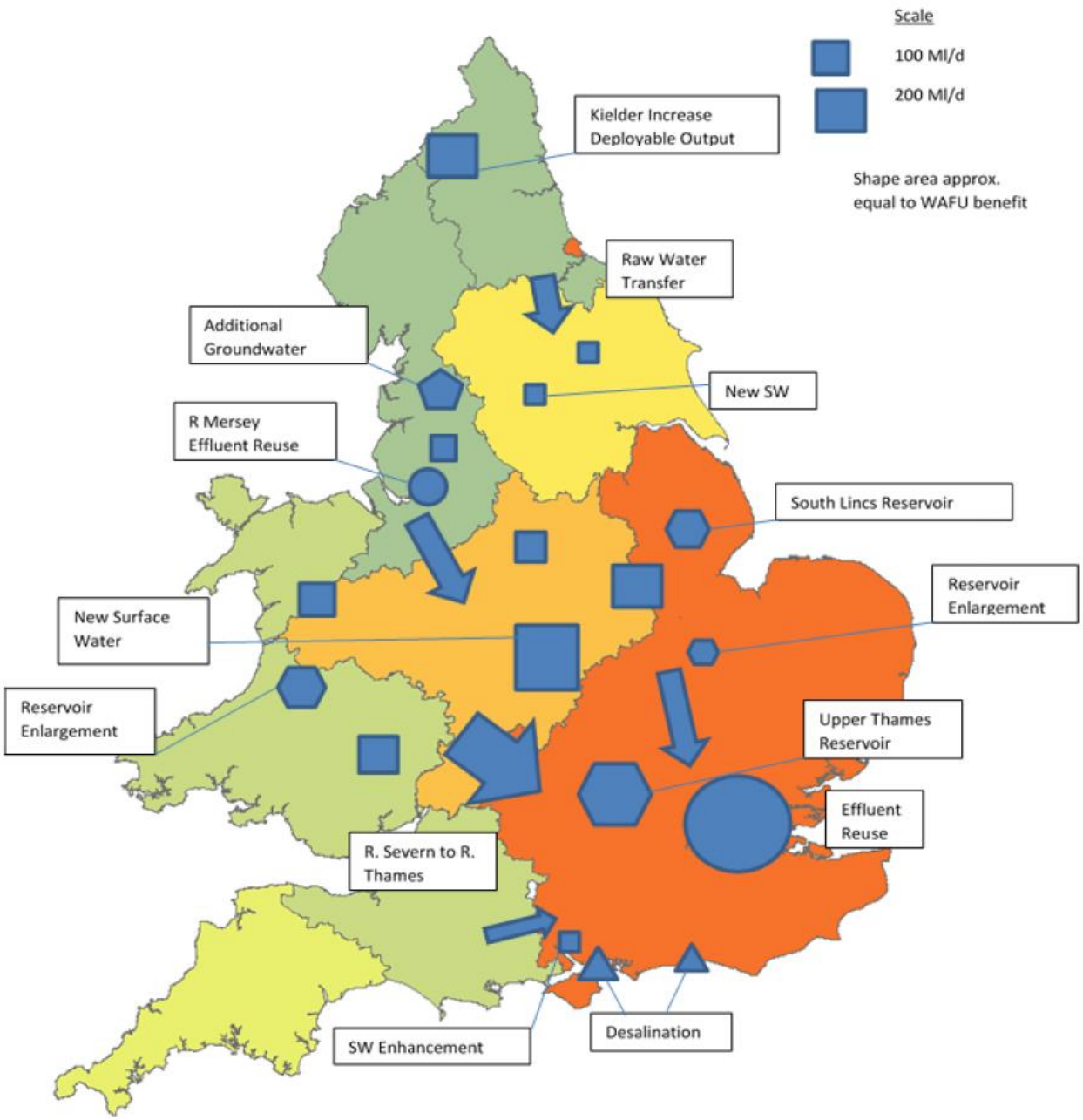
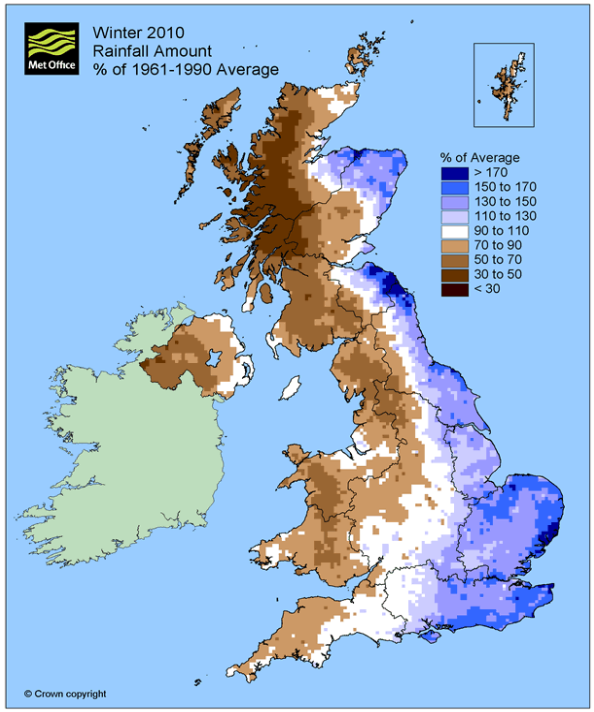


Figure 8-14 Typical Portfolio of strategic supply-side resources and transfers by 2065 under 'mid-range' scenarios or by 2040 under more extreme scenarios



Resilience investment

- Strong case for government to establish consistent national minimum levels of resilience
- The availability of water to agriculture depends upon the resilience of public water supply, which takes precedence in times of water stress.
- The investment needed to increase resilience is relatively modest compared with the cost of drought.
- In most areas the additional costs of becoming resilient to ‘severe’ drought events are less than £4 per household-customer per year
- The value customers place on avoiding severe restrictions, is ten times more than this cost, and is still four times greater than the cost even if low case estimates of the benefits are assumed.
- A ‘twin track’ approach that includes supply enhancement, with associated transfers, as well as demand management, is the most appropriate strategic mix for the future


Met Office
Winter 2010
Rainfall Amount
% of 1961-1990 Average
% of Average
> 170
150 to 170
130 to 150
110 to 130
90 to 110
70 to 90
50 to 70
30 to 50
< 30
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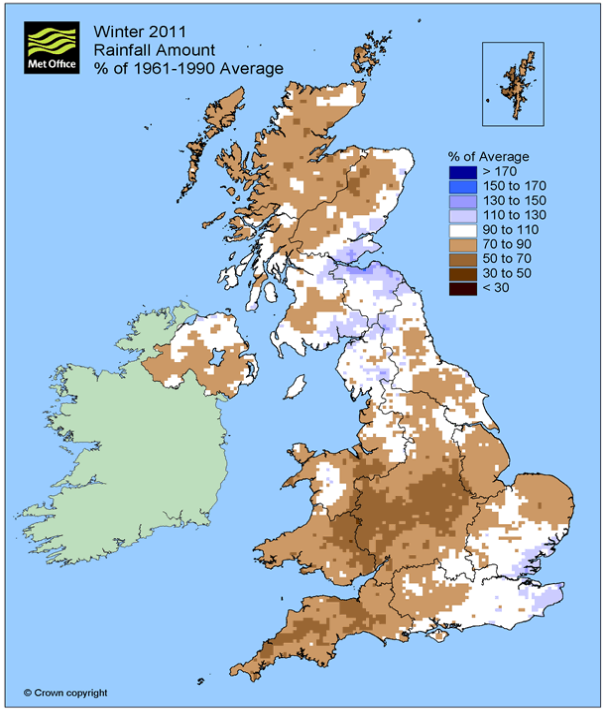
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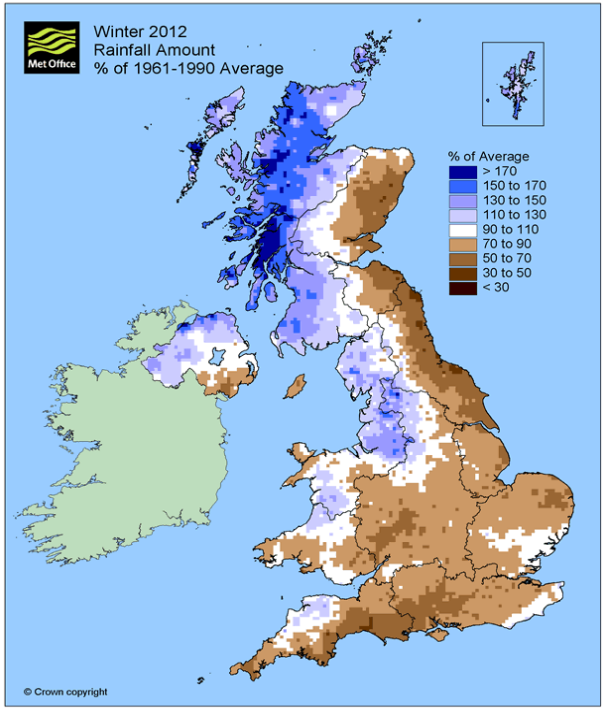
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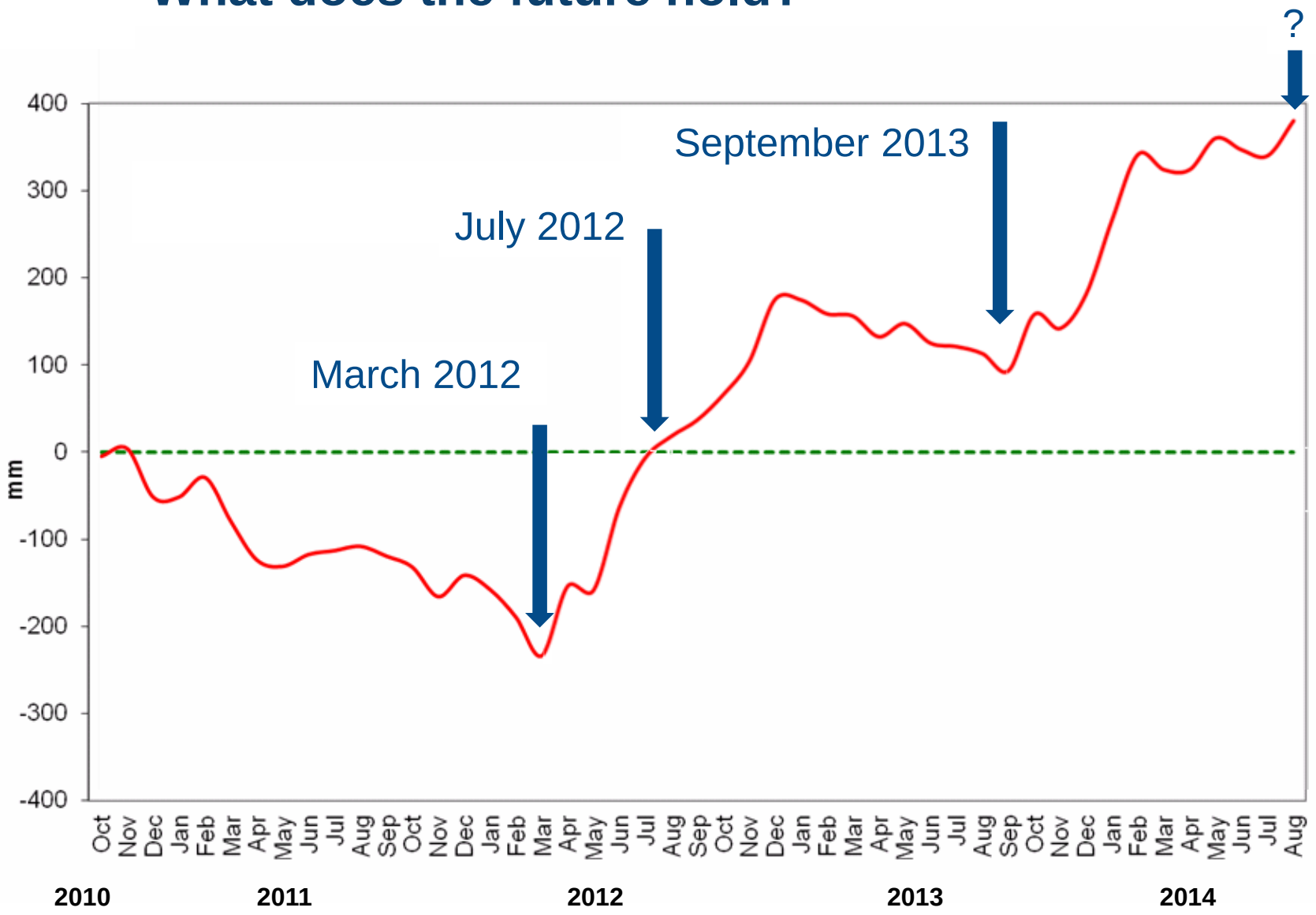
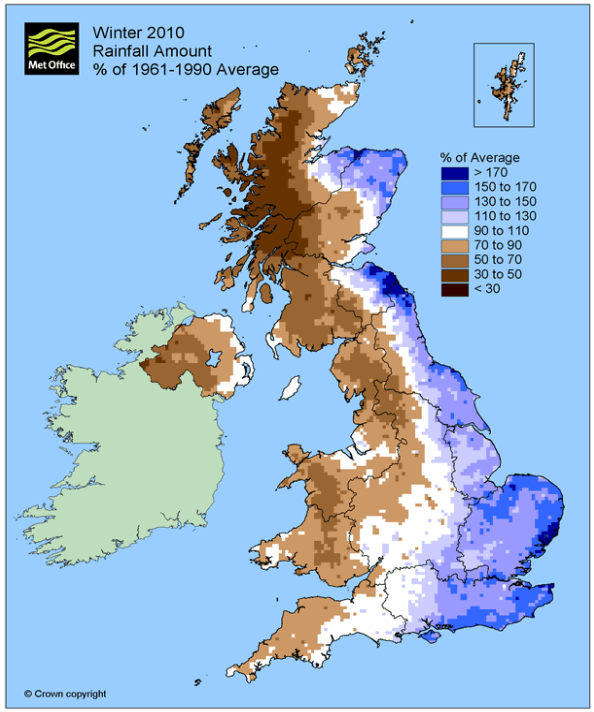
What does the future hold?

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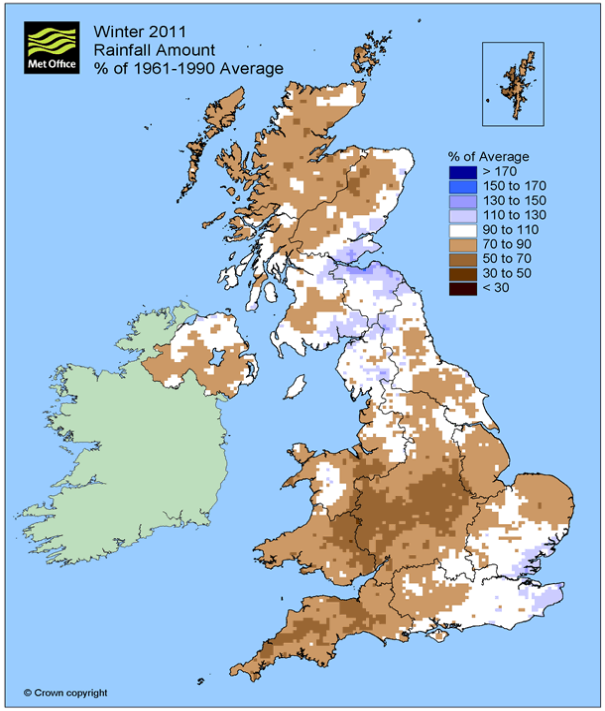
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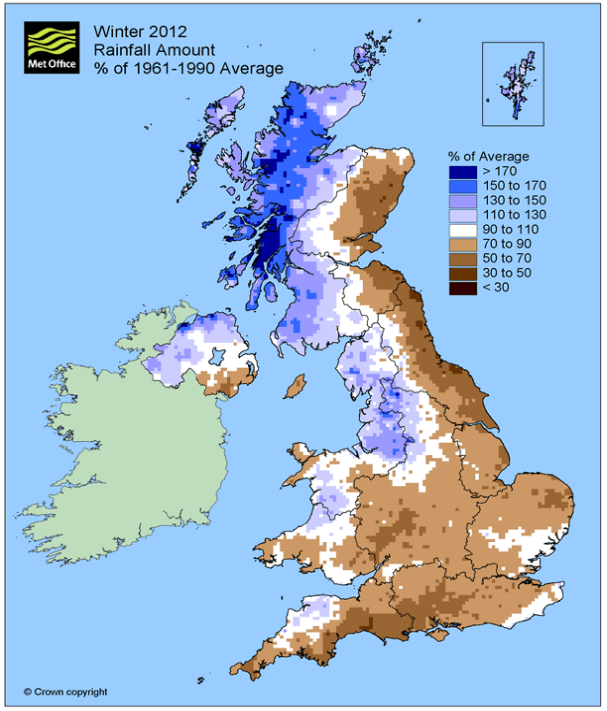
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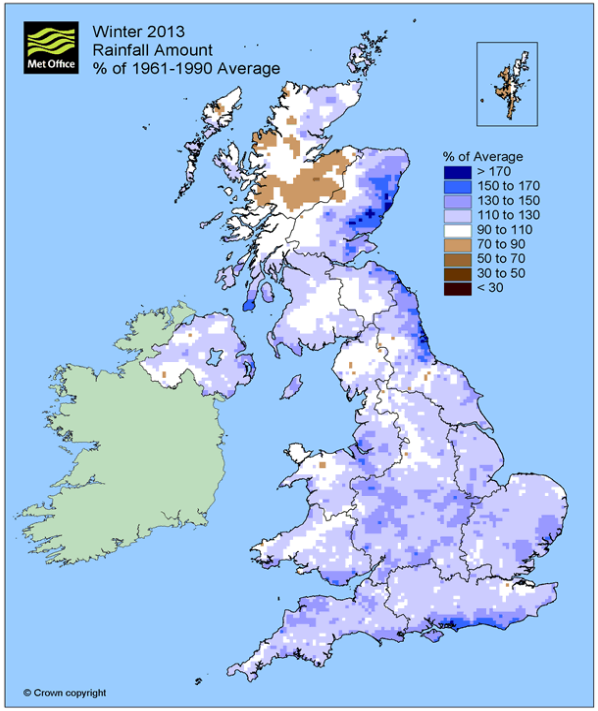
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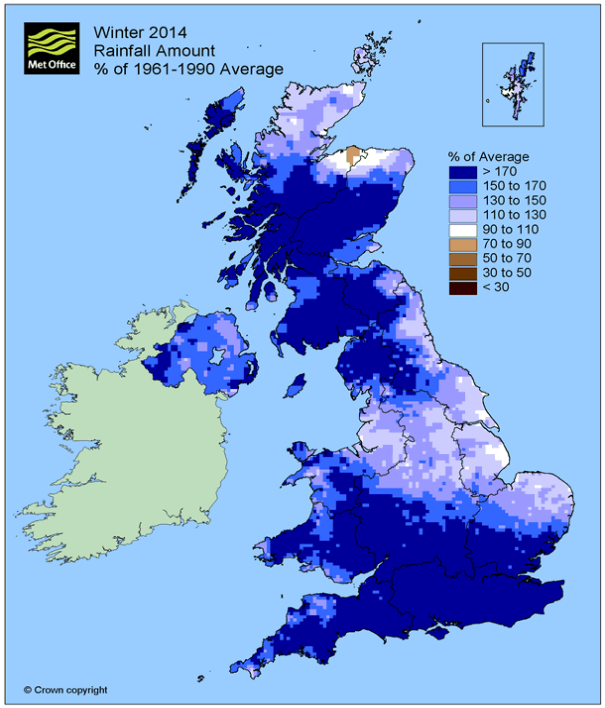
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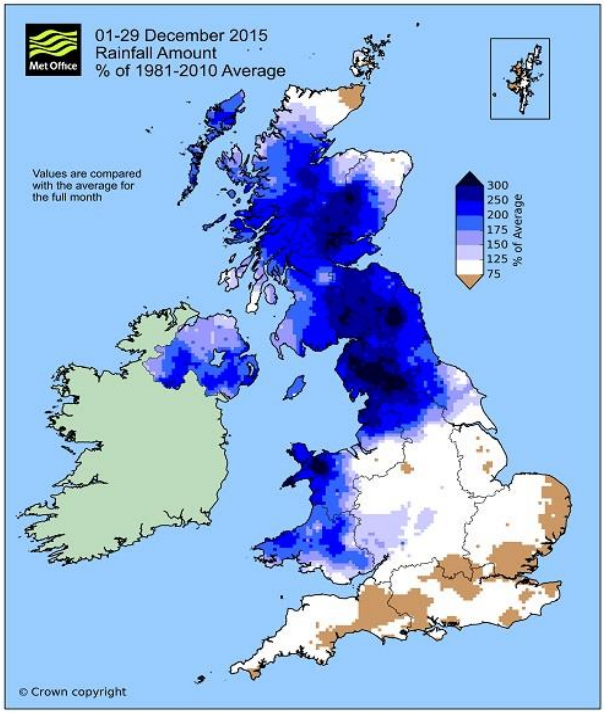
Met Office
01-29 December 2015
Rainfall Amount
% of 1981-2010 Average
Values are compared with the average for the full month
300
250
200
175
150
125
75
% of Average
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Rainfall for September to October in relation to long term average since 1910:

- >120% in 9 to 18% of years
- >100% in 59 to 64% of years
- <80% in 2 to 8% of years
- <60% in 0 to 2% of years

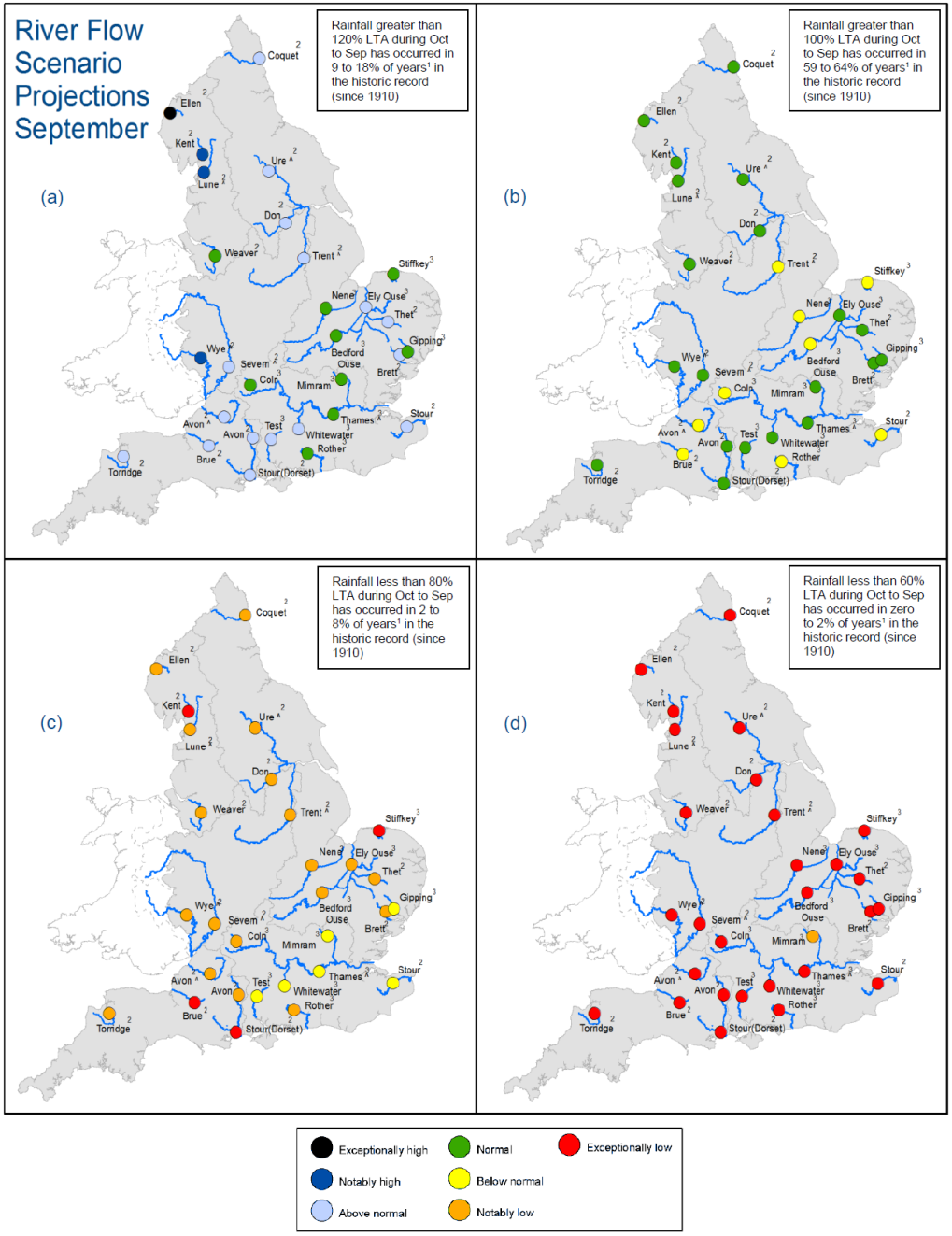
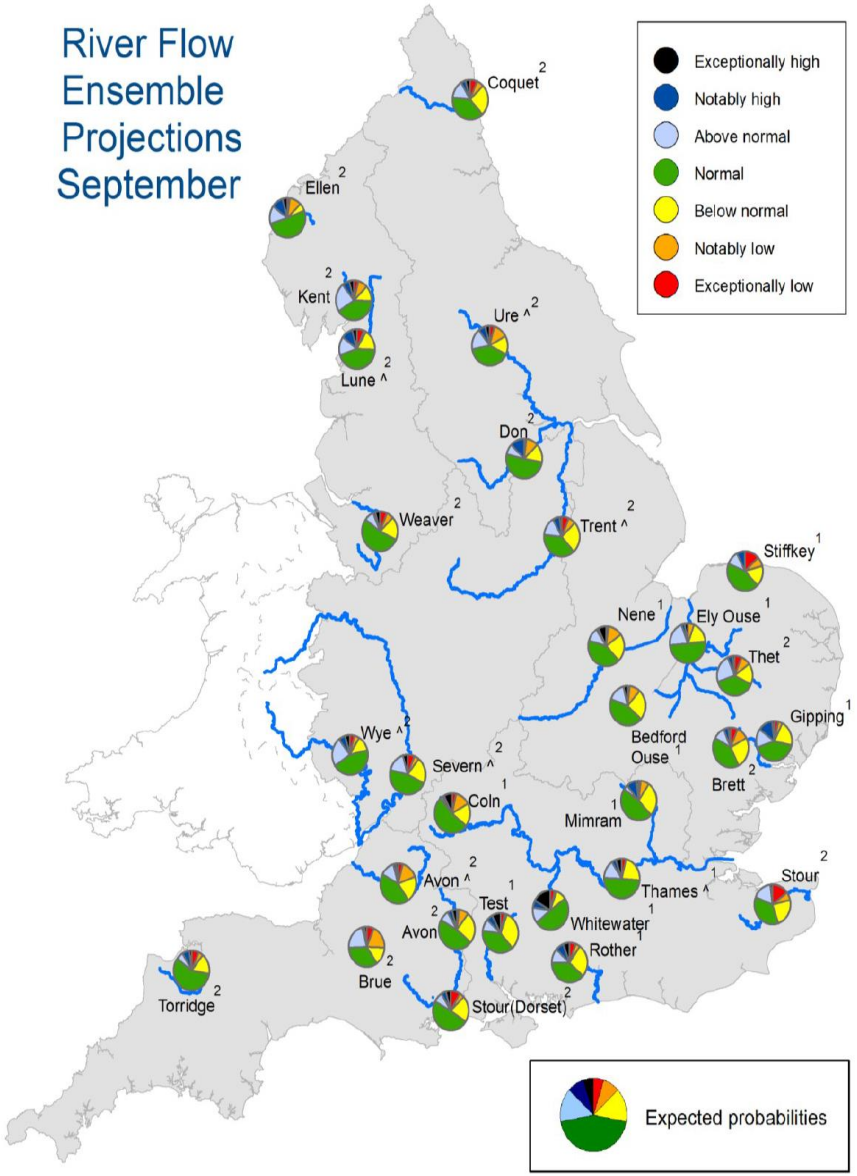


Figure 6.2: Projected river flows at key indicator sites up until the end of September 2017. Forecasts based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between October 2016 and September 2017 (Source: Centre for Ecology and Hydrology, Environment Agency)

Exceptionally high	5%
Notably high	8%
Above normal	15%
Normal	44%
Below normal	15%
Notably low	8%
Exceptionally low	5%



Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Figure 6.4: Probabilistic ensemble projections of river flows at key indicator sites up until the end of September 2017. Pie charts indicate probability, based on climatology, of the surface water flow at each site being e.g. exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency).

Natural Capital

- Help identify whole life costs and unpaid externalities
- Costs and benefits
- Not just cost benefit - don’t net off
- As a means of evaluating options
  - desalination plant, reservoir, water transfer between catchments
  - compensatory habitats, non native species, carbon, differing water chemistries, social impacts, construction and operating impacts, biodiversity
- Where best to locate settlements in relation to the provision of water and sewerage services