4: Indicators of climate change in the UK

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Evidence is mounting that the climate is changing. Globally, 1998 was the hottest year on record, and 6 out of the 10 hottest years ever recorded were in the decade of the 1990s (see Information Sheet 1). Here in the UK, 4 out of the 5 hottest years in the 330-year Central England temperature record occurred in the last 10 years (see Information Sheet 3).

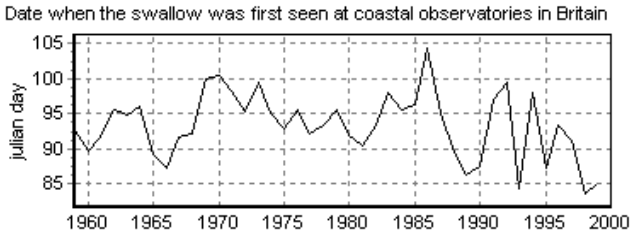
In order to track these changes as they happen across the UK, and as they affect our natural world, economy and society, a set of 34 indicators has been gathered together. These were chosen from a large number of potential candidates on the basis that we expect them to be influenced by climate change (and also because we expect them to be relatively insensitive to non-climate factors).

The indicators can be divided into those measuring the 'state' of the environment and those measuring the 'response' to shifts in climate. State variables include measures of local climate, such as the Central England temperature record and the rainfall gradient across the UK (chosen because climate modelling studies suggest that climate change due to the greenhouse effect might induce stronger precipitation gradients from NW to SE across the UK), as well as sea level rise and hydrology (e.g., changes in groundwater levels). Response variables are drawn from the natural environment (e.g., egg-laying dates of birds, abundance of butterflies, air quality), from the economy (e.g., activity in the tourism industry, domestic gas supply) and from measures of social welfare and behaviour (e.g., number of outdoor fires, seasonal pattern of human mortality, incidence of lyme disease in humans).

A comprehensive list of all these indicators can be found at DETR's ICCUK website. Some examples of the response variables are shown below.

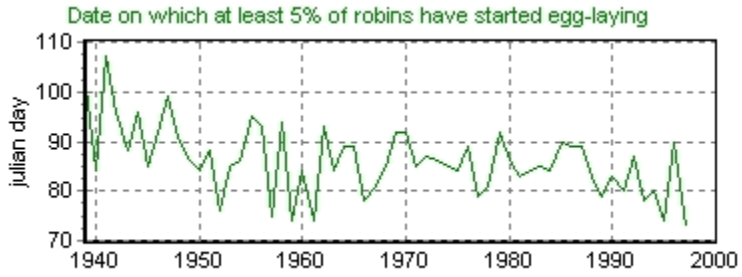
Response indicators from the natural environment–- arrival date of swallows

This indicator is the average date when the swallow (*Hirundo rustica*)is first observed at 4 coastal observatories (Dungeness, Portland, Bardsey and Calf of Man). The birds arrive in numbers only when their food supply of aerial insects is plentiful, which in turn is related to spring temperatures. The graph shows a trend towards earlier swallow arrival dates since 1970 in response to warmer springs. (Julian day = number of days since beginning of the year, 1st January = Day 1).



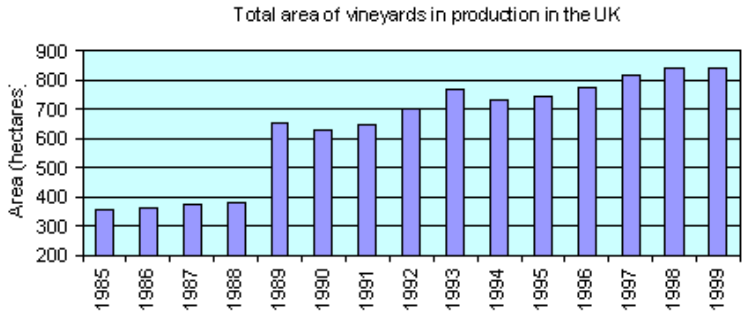
Response indicators from the natural environment - egg-laying date of robins

Data on egg-laying dates have been collected by the British Trust for Ornithology. A recent analysis of 65 species shows that 20 species have tended to lay their eggs 4-17 days earlier in the year over the past 25 years. Birds have evolved to lay their eggs so that nestlings are hatched when food is available and there is food when they leave the nest. Laying dates are therefore strongly related to spring (especially March) temperatures. The example shown here is for the robin (*Erithacus rubecula*). There is evidence of a trend towards earlier laying dates from the very beginning of the record up to the present day.



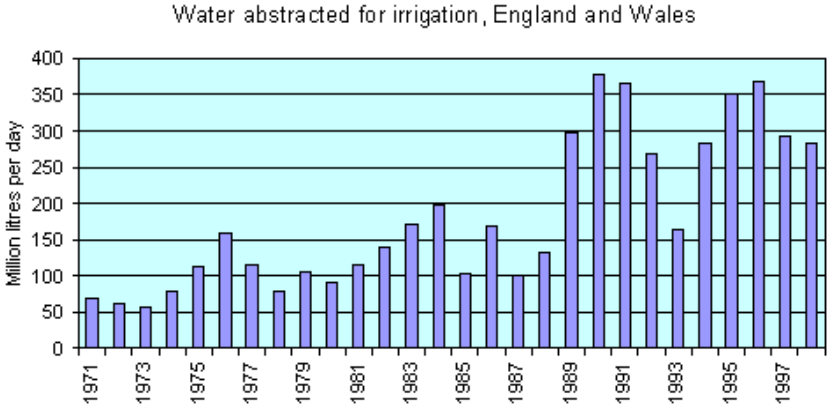
Response indicators from the economy - area of productive vineyards

English vineyards are currently of recreational value for visitors on wine-tasting tours and for around 100 small producers. There are also a few vineyards in the country that operate on a truly commercial scale supplying supermarkets with English wine, but these account for only about 0.3% of UK consumption. This indicator's chief interest is as a cultural symbol of a crop that is believed to have flourished in the warmer climate of Roman Britain and which represents a proxy indicator for the perception of climate changing towards southern European conditions. The upward trend of the graph below indicates a perception (and a desire?) that the English climate is becoming more suited to grape cultivation.



Response indicators from the economy - use of irrigation water for agriculture

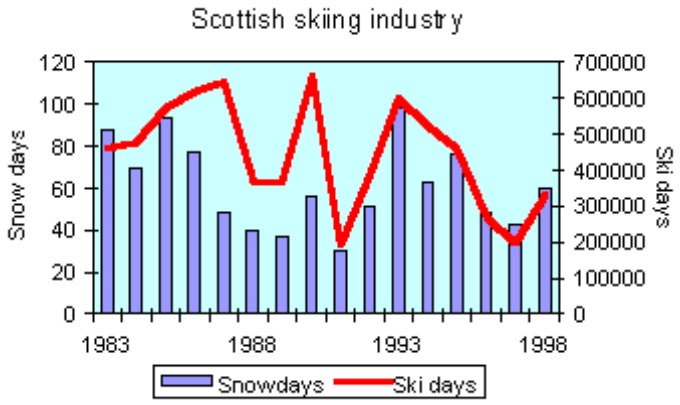
A significant and increasing proportion of the UK's root and vegetable harvest is produced using irrigation, for example 36% of the UK potato crop is currently irrigated. In 1995 potatoes, vegetables and sugar beet accounted for 40%, 18% and 17% of the total area irrigated and the value of the main irrigated crops in England and Wales totalled £2,637 million. The graph shows that the amount of water abstracted for irrigation is greater in dry summers such as 1976, 1990, 1991 and 1995. There is also a long-term upward trend. Since 1981 water abstractions have averaged at least 100 Mega litres per day even in wet years. In 1989, which was a notably dry year, there was a step-jump in abstraction amounts. Since then levels have dropped below 250 Ml/day in only one year, 1993. The installation of irrigation equipment is increasing, partly in response to supermarket demand for a consistent high quality product, but also no doubt in response to the more frequent occurrence of dry growing seasons in recent years.



Response indicators from the economy - the Scottish skiing industry

Although small in comparison to the major European and North American skiing areas, the Scottish ski industry is important to the local economy of the Highland region. It is estimated that expenditure on skiing trips amounts to around £16 million per annum, supporting around 1000 local jobs. The industry is obviously affected by the occurrence of snow, and the graph

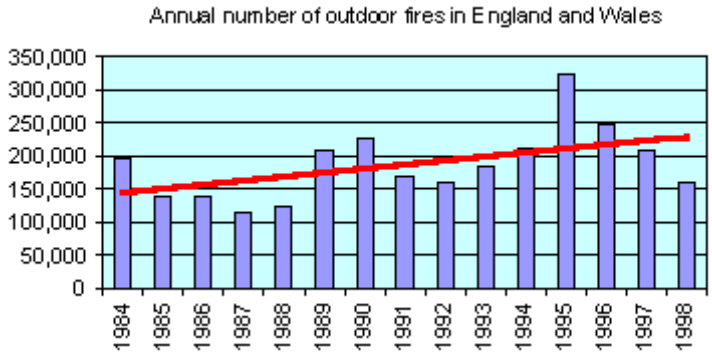
shows the seasonal number of ski-lift and tow passes (ski days) together with the number of days of snow lying at Braemar. Both variables show a downward trend from 1993 onwards, although this is reversed in the most recent year, 1998.



Response indicators of behaviour - number of outdoor fires

In Britain, very few outdoor fires are due to natural events such as lightning strikes. Almost all are caused by the actions of people: either carelessly or deliberately setting fires. People are more likely to be outdoors in hot, dry conditions. Also, such weather is conducive for the spread of fires, requiring the attendance of the fire services when, in wetter or cooler conditions, the fire would be naturally extinguished.

The graph shows that the number of fires fluctuates from year to year, with wet summers such as 1985 and 1997 having fewer fires and dry summers such as 1995 having many more. Superimposed on these fluctuations there appears to be a gradually rising trend, although there is some evidence that this has reversed since 1995.



Acknowledgements

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We thank Tim Sparks of CEH Monks Wood, for permission to reproduce the data on swallow arrival dates, and Humphrey Crick of the British Trust for Ornithology, for permission to reproduce the data on robin egg-laying dates.

Related sites

- British Trust for Ornithology
- Indicators of Sustainable Development for the United Kingdom, maintained by the Department of the Environment, Transport and the Regions

For further information on this subject please contact:
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