

Extreme weather hazards in the UK (Part II)

Introduction

The **UK Climate Projections 2009 (UKCP09)** have been created to help the UK to plan for a changing climate. These projections are based on simulations done by supercomputers. The supercomputers make calculations of how different parts of the Earth's climate such as the atmosphere, the oceans, the land surface and ice, will develop in the future. Together, these calculations are called a **general circulation model (GCM)**.

The purpose of providing information on the possible future climate is to help those needing to plan for a changing climate. Their task might be helping society and the natural environment to adapt. Who do you think should need to make plans?

Figure 2 shows some of the projections, including summer and winter mean temperature, summer and winter mean precipitation, winter wind speed and sea level rise. These are all given for the 2080s assuming a **medium** level of **greenhouse gas** emissions. In the medium **scenario**, CO₂ emissions in the 2080s are roughly double 1990 levels. There is a good deal of **uncertainty** in the projections shown in Figure 2; this exercise only uses the central estimates of change. Obviously, changes in any of these climate variables may have an impact on different types of extreme weather hazards.

It is important to consider how the amount of change depends upon greenhouse gas emissions. This is why projections are also made assuming **low** and **high** levels of greenhouse gas emissions (e.g. summer mean temperature in Figure 4), in order to estimate the full range of possible outcomes.

The tasks in this exercise get you to use and interpret the state-of-the-art UKCP09 projections. The tasks should also get you thinking about the scale of the climate change problem in the UK and how we can go about managing it.

You can explore the UKCP09 projections using the website below.



<http://ukcp09.defra.gov.uk/>

Task 1

Take a look at the variables shown in the in the Figure 2 projections. Which of the variable(s) do you think is most relevant to the future occurrence of the following extreme weather hazards and why:

- (a) Flooding, (b) Drought, (c) Heatwave, (d) Blizzard, (e) Storm surge

Task 2

Figure 3 is designed for you to record the likelihood of different types of extreme weather hazard occurring in each region of the UK in the 2080s. This likelihood, or risk, can be estimated using a numerical scale from 0 to 4 to denote no risk (0), low risk (1), medium risk (2), high risk (3) and very high risk (4). This number can then be recorded next to the appropriate hazard symbol in Figure 3.

But how do you estimate this risk? Well, firstly you need to look at Figure 1 (completed in Part I of this exercise). This will show you whether each region is currently at risk from particular hazards. Secondly, you need to use Figure 2 to estimate whether this risk is going to change by the time we reach the 2080s – is it going to be less, the same, mildly higher or severely higher than today. Finally use the table below to calculate the appropriate risk level from 0 to 4.

	Significant present risk	No significant present risk
Risk less in 2080s	1	0
Risk the same in 2080s	2	0
Risk mildly higher in 2080s	3	1
Risk severely higher in 2080s	4	3

For example, Figure 1 should show that Wales is at risk from heavy rainfall in today's climate. Figure 2 shows that winter weather is likely to be much wetter in Wales by the 2080s. Therefore, using the table above, the risk of heavy rainfall in Wales in the 2080s is 4.

When you have completed Figure 3, try to following questions:

- How would you estimate the most hazardous region of the UK in the 2080s?
- Which region is it?
- The risk of which type of extreme weather hazard shows widespread decrease by the 2080s?
- Suggest how it might be too simplistic to estimate future extreme weather hazards in this way?

Note: Words shown in bold type are defined in the glossary.



Task 3

Climate scientists have also produced projections according to a low and high estimate for future **greenhouse gas** emissions. Figure 4 shows what these projections look like for summer mean temperature. You can compare these to the medium estimate shown in Figure 2.

The possible social and economic conditions associated with the high and low projections are given in the table below. As you can see, they are very different possible futures. Under the high **scenario**, energy production is fossil-fuel intensive much like it is today. The low scenario assumes that the world finds solutions to economic, social and environmental sustainability.

HIGH emissions	LOW emissions
<ul style="list-style-type: none"> Fossil fuel intensive. 	<ul style="list-style-type: none"> Introduction of clean and resource efficient technologies.
<ul style="list-style-type: none"> Rapid economic growth and market-based solutions. 	<ul style="list-style-type: none"> Economy based on services and information. Strong welfare state.
<ul style="list-style-type: none"> Large cities with sprawling suburbs. 	<ul style="list-style-type: none"> Compact cities with controlled suburban growth.
<ul style="list-style-type: none"> High car ownership and dense transport networks. 	<ul style="list-style-type: none"> Public and non-motorised transport.
<ul style="list-style-type: none"> High consumption of commodities. 	<ul style="list-style-type: none"> Resource-friendly lifestyles. Emphasis on reuse and recycling.
<ul style="list-style-type: none"> Increased consumption of meat and dairy products. 	<ul style="list-style-type: none"> Low input, low impact agriculture. Lower meat consumption.
<ul style="list-style-type: none"> Environment used and managed rather than protected. 	<ul style="list-style-type: none"> Environmental protection and large areas of maintained wilderness.

- (a) Which scenario do you think is most likely for (i) the UK and (ii) the world as a whole and why?
- (b) Give reasons for how the conditions listed in the table above may lead to the climate changes shown in Figure 4 for the:
- Low scenario
 - High scenario
- (c) Would a high or low scenario world be better prepared to cope with an increase in the frequency and magnitude of extreme weather hazards?



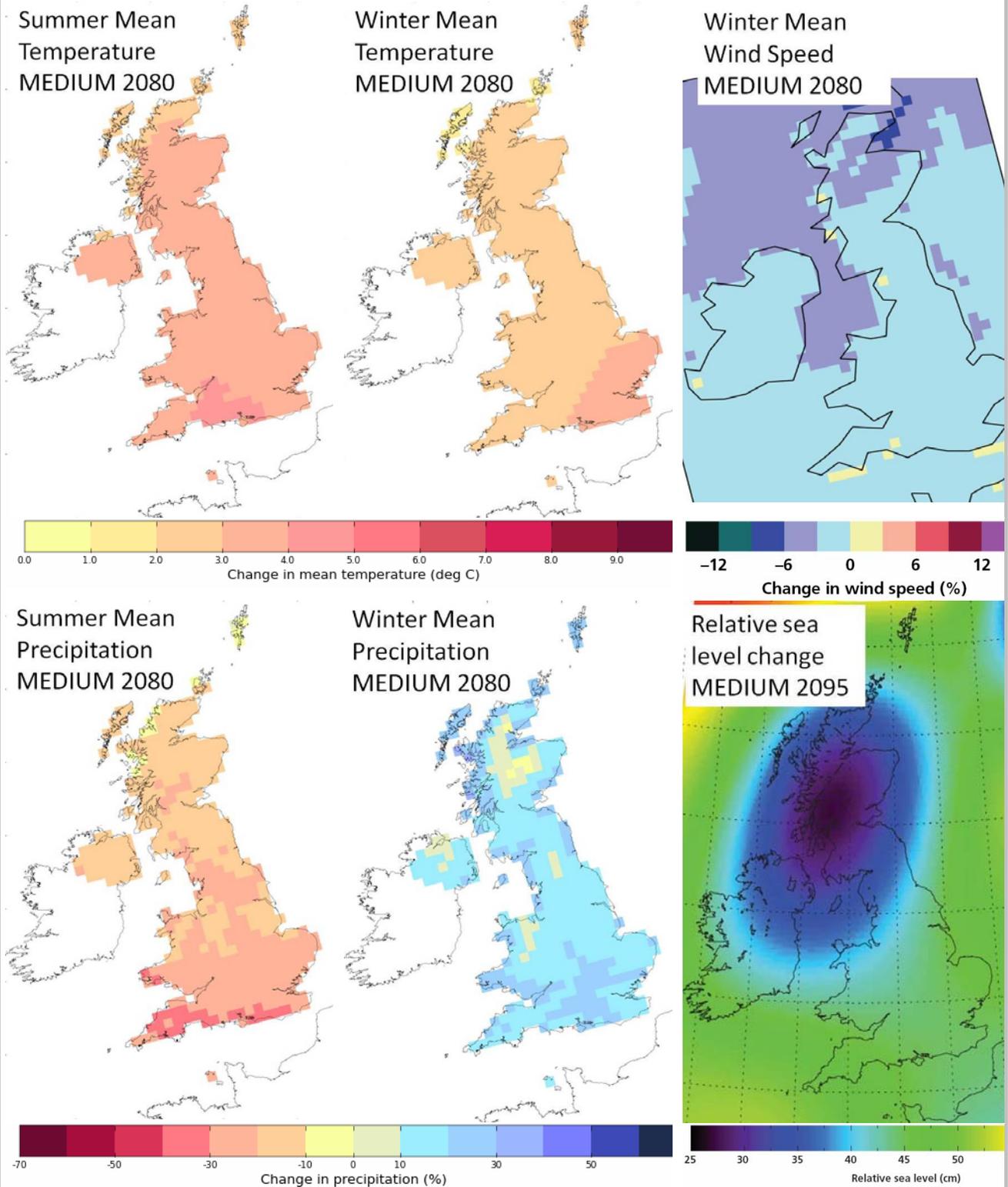
Extension

A press release is a short summary of a piece of news, which you can use to publicise the key elements of a story to journalists. Figure 5 is an example of a press release about new research on the Thames Estuary. The most important feature of a press release is that it needs to be topical – it should make absolutely clear what is new.

Write your own press release based on the work you have completed in this exercise. Imagine you are communicating with a group of journalists and you have to tell them about the future impact of climate change on extreme weather hazards in the UK. Remember, they are going to use your release as the basis for a newspaper story, perhaps even a headline!

Figure 2

Changes in climate variables by the 2080s (2095 in the case of the relative sea level map) under medium emissions scenarios as projected in UKCP09.

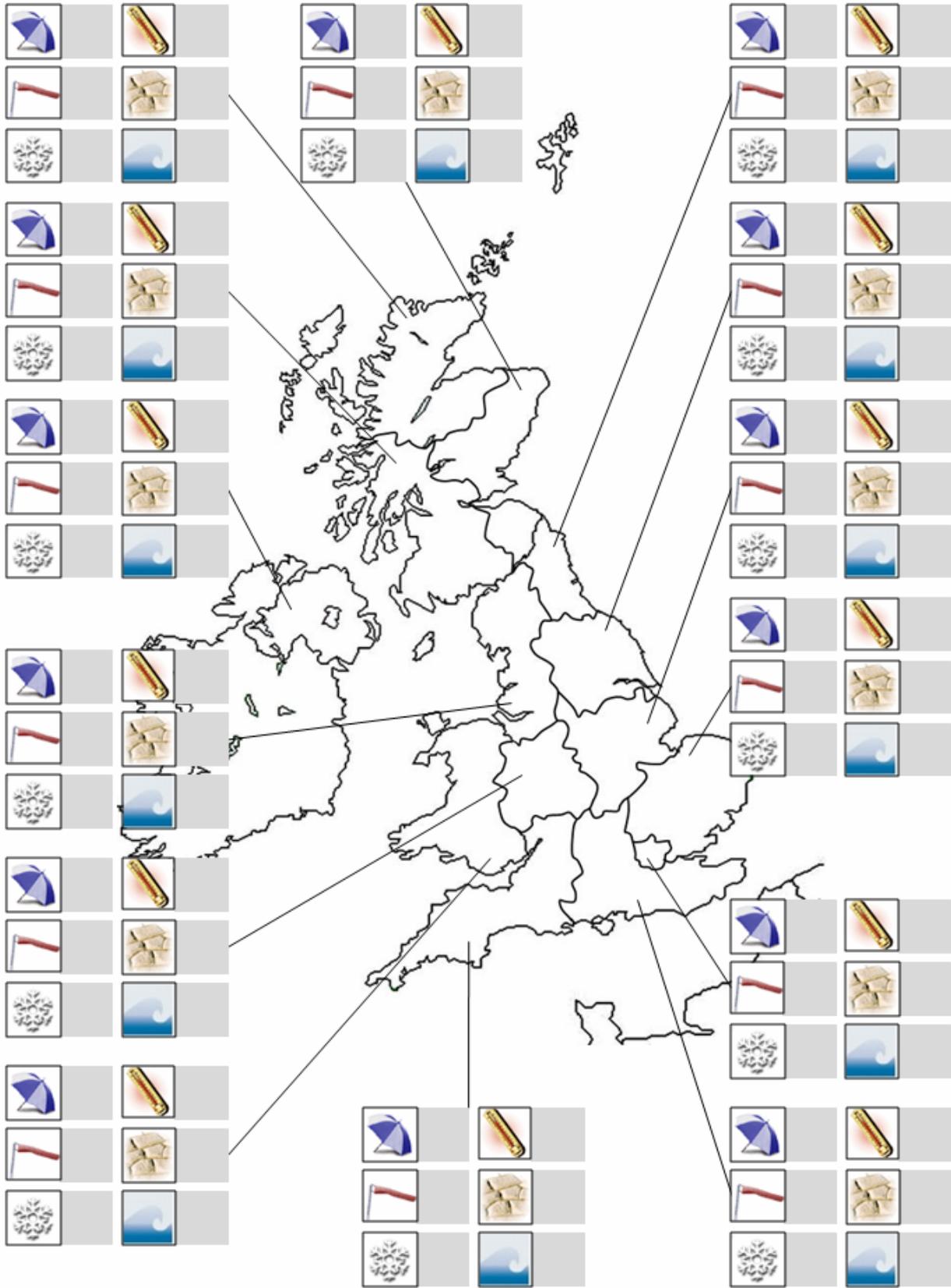


Note: Words shown in bold type are defined in the glossary.



Figure 3

Extreme weather hazard risk in the 2080s.



Note: Words shown in bold type are defined in the glossary.

Figure 4

Low and high projections for summer mean temperature in 2080s.

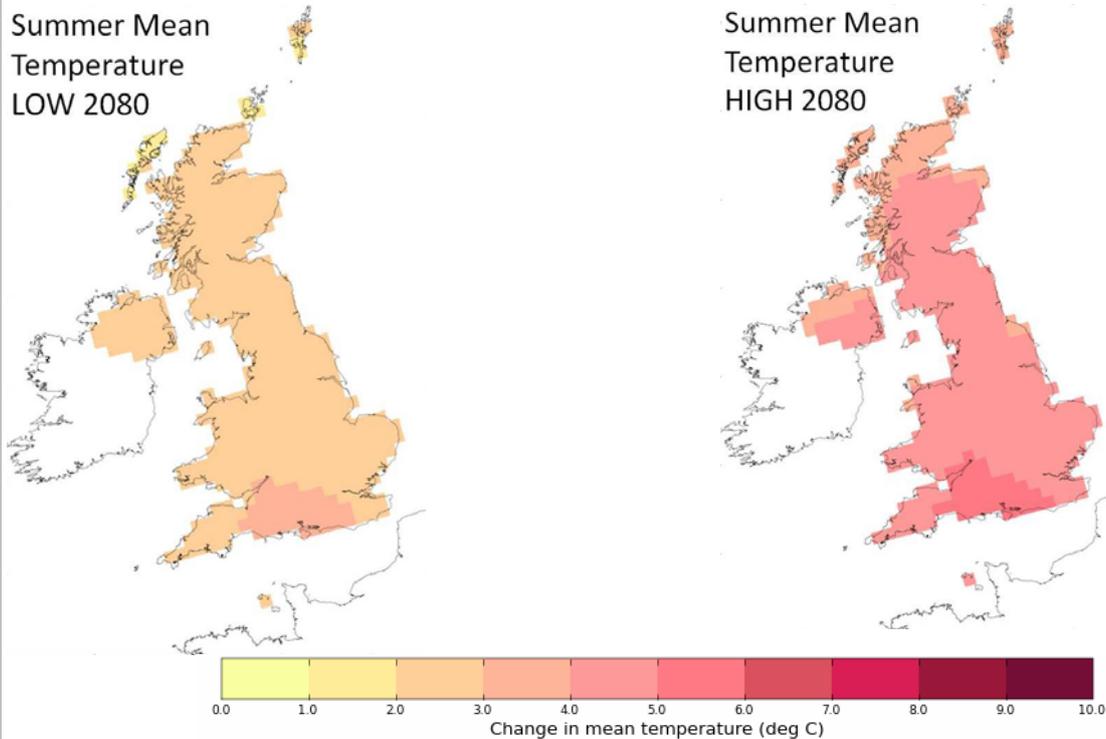


Figure 5

Fig. 5: Press release from the Met Office

Climate change and the Thames Estuary

23 September 2008



Critical research findings that will help plan future flood risk in the Thames Estuary are revealed today as part of the Environment Agency's Thames Estuary 2100 Project — a project that considers an adaptive approach for planning for future flood risk in the Estuary. The results confirm that current Government predictions and previous flood scenarios are realistic and have gone a long way to reducing the uncertainty around maximum water levels.

The key findings from this new research are as follows.

- Sea-level rise in the Thames over the next century due to thermal expansion of the oceans, melting glaciers and polar ice is likely to be between 20 cm and 90 cm.
- There remains much uncertainty over the contribution of polar ice melt to increasing sea-level rise. At the extreme, it may cause sea level to rise by a total of up to 2 metres (including thermal expansion).
- Climate change is less likely to increase storm surge height and frequency in the North Sea than previously thought.
- Future peak freshwater flows for the Thames, at Kingston for instance, could increase by around 40% by 2080.

Crucially, in terms of the Thames estuary, this research means that:

- current Government predictions for sea-level rise in the Thames Estuary are realistic;
- the Environment Agency's Thames Estuary 2100 project is using the best available climate-change science to plan with confidence for future flood management on the Thames Estuary;
- previous worst-case scenario of increases in maximum water levels can be revised down from 4.2 metres to 2.7 metres. Such a reduction in worst-case scenario for this century means that a tide-excluding estuary barrage is unlikely to be necessary to manage flood risk this century.

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