



Climate adaptation: Risk, uncertainty and decision-making

UK Climate Impacts Programme

The UK Climate Impacts Programme (UKCIP) helps organisations assess how they might be affected by climate change, so they can prepare for its impacts. Based at the University of Oxford, we were set up by the Government in 1997 and are funded by the Department for Environment, Food and Rural Affairs (Defra).

We can help you manage research into how your sector or region may be affected by climate change and help you develop an adaptation strategy.

We offer a range of tools and data to help with climate change risk assessments and developing adaptation strategies. As well as this leaflet and the accompanying report, there are climate change scenarios, socio-economic scenarios and a methodology for costing the impacts of climate change.

To request a copy of *Climate adaptation: Risk, uncertainty and decision-making* or to find out more, contact UKCIP at Union House, 12-16 St Michael's Street, Oxford, OX1 2DU, telephone 01865 432076, fax 01865 432077, email enquiries@ukcip.org.uk or see our web site www.ukcip.org.uk.

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An introduction

We now have convincing evidence that our climate is changing and that these changes are not part of a natural cycle. However, because our knowledge of climate and future levels of greenhouse gases is incomplete, uncertainty over the nature of this change in climate remains.

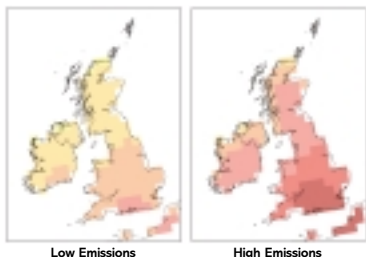
Even if changes in climate could be accurately predicted, uncertainty would still surround the effects these changes will have on our society. But advances in our understanding of climate and improved computer models mean we can provide climate change scenarios as a basis for assessing some aspects of climate risk.

Over the coming decades, climate change will affect many aspects of our lives, our environment, businesses and the economy.

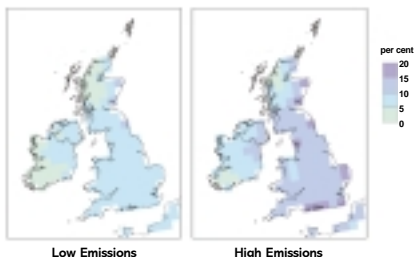
For instance, it is very probable that we will experience hotter summer temperatures, and greater risk that winter flooding will affect our buildings and infrastructure.

There will be more extreme climatic conditions – such as intense rainfall. While extreme events are by definition rare, they often have the most significant effects. Unfortunately, changes in such events are also difficult to predict, so information on extremes is more uncertain.

Change (°C) in summer average daily temperature - 2050s



Percent change in winter precipitation - 2050s



Changes in average summer temperature and winter precipitation for the 2050s. Based on the UKCIP02 Low Emissions and High Emissions climate change scenarios, relative to the baseline period 1961-1990.

The UK Climate Impacts Programme and the Environment Agency have produced the report *'Climate adaptation: Risk, uncertainty and decision-making'* to help you, as a decision-maker, judge how important the climate risk is, compared to the other risks you face. It could also help you identify opportunities offered by a changing climate, such as growing markets and products designed to cope with the future climate.

Some decisions are directly driven by the need to manage climate risks – such as improvements to flood defence and development planning controls. But many decisions involve climate change as one of a number of risk factors. The importance of climate change in such

decisions is less obvious. For example, in time, climate change will affect where certain agricultural crops can be grown successfully – and this in turn will affect the profitability of existing crop processing plants, and decisions about new facilities.

The report will help you answer the questions:

- Should I be concerned?
- Should climate change influence my decisions today?
- What are the climate change risks that could affect my decision?
- What adaptation measures are available or required?
- When should adaptation measures be implemented?
- Are there opportunities?

The report will help if you:

- manage the consequences of present-day variability in weather or climate
- make decisions with long-term consequences (decades or longer) for land-use, built assets or population groups
- are responsible for infrastructure and business areas that are sensitive to changes in climate.

It will help you deliver policies and projects that are robust in the face of an uncertain future climate, and adapt successfully to climate change.

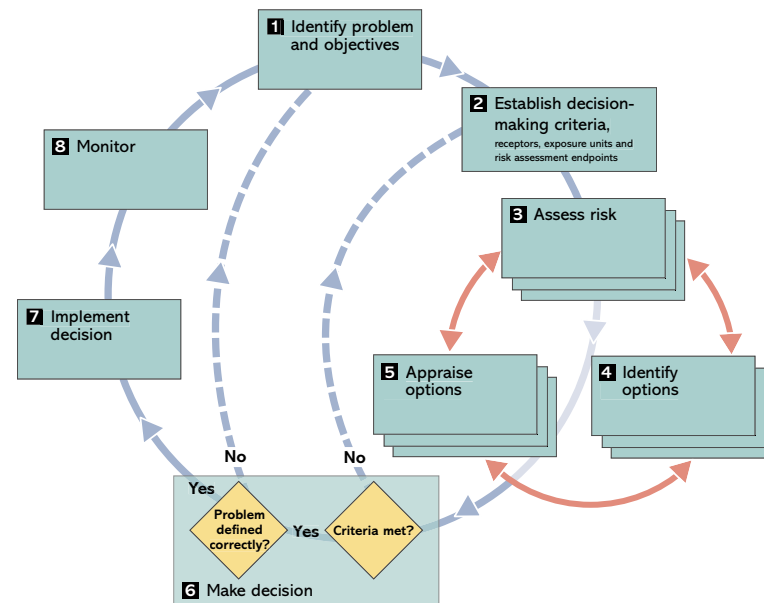
The report *‘Climate adaptation: Risk, uncertainty and decision-making’* provides an eight-stage decision-making framework (see opposite). There are questions to answer at each stage, and recommended tools to help. These range from simple brainstorming through to more complex techniques, such as cost-benefit analysis.

If you know how weather affects your business, you already have a basis for understanding how the climate risk may change in the future. Here, tools such as influence diagrams or checklists can help.

You should make sure you involve all relevant stakeholders early on, so you don't miss any important issues, and so that everyone understands the decision-making process. Remember to keep a record of the process, to make it easier for others to review.

The decision-making framework:

- directs you to undertake rapid risk characterisation and screening exercises, before deciding whether to spend time and money on a more detailed risk assessment
- helps you refine your problem and objectives, and modify your options before making a decision
- guides you to review a decision, (e.g. did it deliver the benefits you were expecting? did it have consequences for other stakeholders?)



Key questions

- 1** • What are the main drivers behind the decision?
• Is it explicitly about adapting to future climate?
• If not, could climate change be an important factor?
- 2** • What are the criteria for recognising a successful outcome?
• What are the legislative requirements or constraints?
• What are the rules for making the decision – are you risk-averse, or focused on maximising benefit or minimising cost?
- 3** • What is the lifetime of your decision?
• Which climate variables could be most important?
• How could climate change affect your ability to meet your objectives?
• What non-climate factors could also be relevant?
• Are climate or non-climate factors likely to be most important?
- 4** • What range of options should be considered?
• What are the consequences of a 'delay' or 'doing nothing' option?
• Can 'no regret' options be found?
• Can flexible options be found?
- 5** • How do these options rate against your criteria?
• Could particular options make it difficult for others to manage climate change?
- 6** • Is there a clear preferred option?
• Were the criteria adequate?
• Did you define the problem correctly?
- 8** • Did the decision deliver the expected benefits?
• Does new information – e.g. on climate change – require the decision to be revisited?

The choices you make will depend on your attitude to climate and non-climate risks. For instance, choices about how much adaptation to carry out, and when to do it, will depend on how large a margin of safety you want. A bigger margin will probably involve higher costs.

Adaptation to climate is not risk free. You may underestimate the climate risk, so you are not adequately protected. Overestimating the risk may mean that resources are wasted. The report will help you judge how significant the risk is, alongside the other risks you face.

The report outlines a range of climate change adaptation strategies, such as sharing the climate risk through insurance, or avoiding the risk by relocating or redirecting your efforts.

Adaptation strategy type

Example

Share loss	Insure business against weather losses
Bear loss	Accept loss of some coastal areas to sea level rise
Structural or technological change	Strengthen building foundations to cope with increased subsidence risk
Legislation or institutional change	Strengthen planning guidance on developments in flood risk areas
Avoid risk	Grow new agricultural crops better suited to new climate
Research	Use research to better understand the climate risk
Education	Increase public awareness about coping with flooding at home

Whatever strategy you choose, you should:

- try to keep your options open and flexible, so that further measures or other strategies can be put in place in the future
- avoid making decisions that will make it more difficult to cope with future climate – such as inappropriate development in a flood risk area
- try to find 'no regret' options, which will deliver benefits whatever the extent of climate change - such as raising awareness of flood risks and of the need to use water wisely.

Other useful guidance on risk, uncertainty and decision-making

Defra, the Environment Agency and the Institute for Environment and Health have published 'Guidelines for Environmental Risk Assessment and Management – Revised Departmental Guidance' (2000), available from TSO.

The Cabinet Office Strategy Unit has published 'Risk: Improving government's capability to handle risk and uncertainty.' Their website has links to websites that contain guidance on risk. See www.strategy.gov.uk/2002/risk/risk/home.html.

HM Treasury produces the Treasury Green and Orange books, which include guidance on the management of risk and project appraisal. See www.hm-treasury.gov.uk.

The Advisory Committee on Business and Environment (ACBE) has produced a commentary on the UKCIPO2 climate change scenarios and guidance on business risks and opportunities. See www.defra.gov.uk/environment/acbe.

The Tyndall Centre for Climate Change Research is conducting a number of projects under the research theme 'Adapting to climate change'. See <http://www.tyndall.ac.uk/research/theme3/theme3.shtml>.