Environment Agency

Climate Ready

Adaptation Wizard

Contents

Preface

The Adaptation Wizard is a tool to help your organisation adapt to a changing climate.

This tool is an updated version of the UKCIP Adaptation Wizard originally developed by the UK Climate Impacts Programme (UKCIP). Since Version 3.0 of the UKCIP Adaptation Wizard was released in 2010, the Environment Agency has taken on the role of the government's support service on climate change adaptation. Key tools developed by UKCIP have been updated and transferred to the Environment Agency to form part of Climate Ready's advice and guidance. These and other tools can be found in the Resources Section on the Climate Ready website. www.environment-agency.gov.uk/climateready

The Adaptation Wizard takes you through a five-step process (see Figure 1) that will help you to:

- assess your organisation's vulnerability to current climate and future climate change
- identify options to address your organisation's key climate risks
- help you develop and implement a climate change adaptation strategy

To get the most out of the Adaptation Wizard we recommend you read About the Wizard before proceeding to Step 1 Getting started.

Case studies that describe how individual organisations have previously used the Wizard to help them adapt are detailed in the resources section of this document.

To find out more about the need to adapt to climate change go to Why should I consider adapting to climate change and the web pages of the Climate Ready support service www.environment-agency.gov.uk/climateready

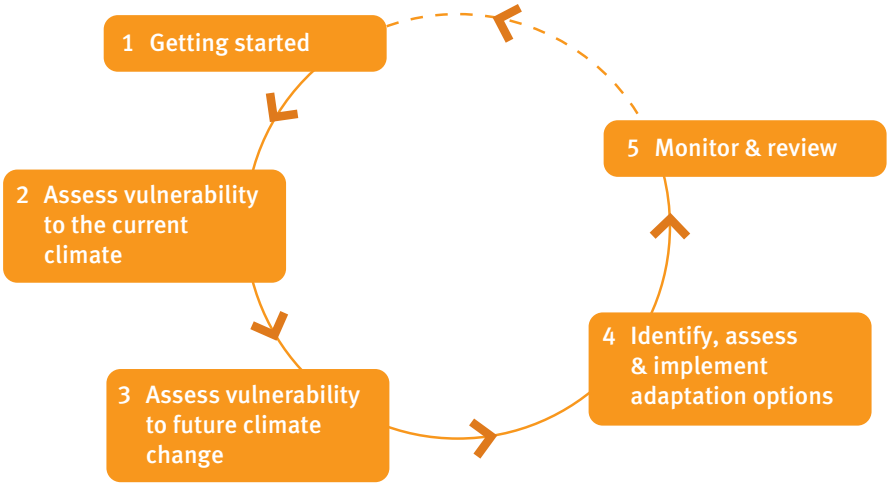

Figure 1: The Adaptation Wizard's five steps. Image © UKCIP, 2010

About the Wizard

Whether you are new to climate change and looking to find out more, or suspect that you will be affected by climate change and are looking for guidance on how to adapt, the Wizard can help you.

What can I use the Wizard for?

It will take you through a five-step process that will enable you to:

- teach yourself, your colleagues and wider professional network about climate change adaptation
- access complementary information, tools and resources to help you prepare for a changing climate
- conduct a high level assessment of your sensitivity to the current climate and to future climate change
- make a decision or develop a project, programme, policy or strategy that is resilient to climate change
- develop a climate change adaptation strategy in a way that internalises the learning process.

The benefit of this approach is that it will enhance the capacity of the individuals involved and of your organisation as a whole to respond to climate change.

What can the Wizard not do?

The Wizard will not produce a tailor-made climate adaptation strategy at the click of a button.

It provides a framework and resources that will help you to generate the information you will need to prepare your own adaptation strategy.

If you are making a decision involving a major investment, or one which has a very long time scale, you will probably need to undertake a thorough risk assessment. If you do not already use a risk assessment tool, you may find the 'Decision Making Framework' listed in the resources section of this document helpful.

How should I use the Wizard?

After reading the Introduction, all users should start with Step 1 and complete the tasks in Questions 1.1–1.4. Once you have established what you hope to achieve by working through the Wizard, work steadily through the process with your assembled team, answering the questions and completing the tasks presented in each step.

Towards the back of this document you will find the 'Adaptation Wizard Notepad'. As you work through the Wizard, keep a full record of your answers to all of the questions and tasks on the notepad. This will allow others to follow the process and interrogate your decision making.

In completing this process, you may wish to refer to guiding principles of effective adaptation developed by Defra[1].

[1] Measuring Adaptation to Climate Change – A Proposed Approach, Defra, 2010. Available from: http://archive.defra.gov.uk/environment/climate/documents/100219-measuring-adapt.pdf (182KB)

Adaptation actions should be:

- Sustainable
- Proportionate and integrated – assess climate risks as part of normal risk management
- Collaborative and open – work in partnership with relevant individuals and organisations
- Effective – actions should be context specific, implementable and enforceable
- Efficient
- Equitable

Make sure you have completed each step properly by referring to the checklist at the end of each step.

Please note that the adaptation process is iterative. You will need to revisit your work to keep it accurate and relevant. It is therefore crucial to be explicit about the information, assumptions and judgements on which your decisions are based and to keep clear records of these.

Information for particular applications

If you are using the Wizard to:

- Raise your awareness of climate change and adaptation, work through each step, drawing on the resources referred to in each. It is not essential for you to complete all the tasks and exercises included in each step, although these might be useful in explaining more precisely what each step involves.
- Assess your vulnerability to climate change, work steadily through the Wizard to the end of Step 3, answering all the questions and completing all tasks. If doing so identifies a need for you to do more, continue to Steps 4 and 5.
- Make the case for adaptation in your organisation, concentrate on assessing your organisation's vulnerability to current climate variability (Step 2). In doing so you may expose valuable opportunities or important climate risks that had previously gone unnoticed and will be able to build a profile of your potential vulnerability to climate change.
- Make a decision, or develop a project, programme, policy or strategy, that is resilient to climate change, or develop and implement a climate change adaptation strategy, work steadily through the Wizard to the end of Step 5, answering all the questions posed in each step. Complete all tasks and make full use of the information and resources provided to do so. Make sure you work with the necessary stakeholders and in accordance with the principles of good adaptation.

What resources will I need to complete the Wizard?

Completing the Wizard involves working with colleagues and partners to gather information and answer the questions asked of you. Unless your assessment reveals a need to commission further research to quantify your climate risks or evaluate various adaptation options, completing the Wizard involves few capital costs. The primary cost is your time and your colleagues' time to work through the Wizard, gather information and answer the questions posed.

Experience suggests that once you have assembled your team, you should hold a start-up meeting to clarify the aims, objectives and desired outcomes of the process. Three further half-day workshops will probably be needed to undertake Steps 2, 3 and 4, supported by as much interim work as required.

Reading through the Wizard takes about 2 hours. Completing the tasks can take a few weeks or even months depending on the availability of those involved, the complexity of your information requirements and data or information availability. Implementing your adaptation measures and monitoring their effectiveness is an on-going process that will take months or years.

The costs of implementing your chosen adaptation measures should be considered separately, as these are obviously contingent on the outcome of your assessment process.

How to reference the Adaptation Wizard

The Adaptation Wizard should be referenced as follows:

- The Adaptation Wizard v CR_4.0. 2013. Environment Agency, Bristol.

To quote a URL, see the Climate Ready web pages www.environment-agency.gov.uk/climateready

Why should I consider adapting to climate change?

The purpose of climate change adaptation is to enable an organisation to reduce the negative costs and impacts of climate change and to take advantage of any opportunities that might arise as our climate changes.

Climate adaptation aims to increase our resilience to future climate impacts and improve our capacity to adapt. It includes actions to cope with on-going natural variability in the climate system as well as changes that are expected to occur over longer timescales into the future.

There are several good reasons for adapting to climate change now.

Our climate is changing and will continue to change into the future. Greenhouse gases already present in the atmosphere will cause global temperature to rise by at least 1°C over the next 30–40 years and by as much as 4°C by the end of the century. A certain amount of warming is now unavoidable due to gases already present in the atmosphere. We are already seeing the effects of this warming and will continue to do so for years to come. Adaptation is crucial to deal with the unavoidable impacts of climate change to which we are already committed.

Figure 2 shows three emissions scenarios to 2100 from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The solid lines represent the best estimate of surface warming and the shading represents the likely range for each scenario. The orange line shows the warming that would result if greenhouse gas concentrations were held constant at year 2000 levels.

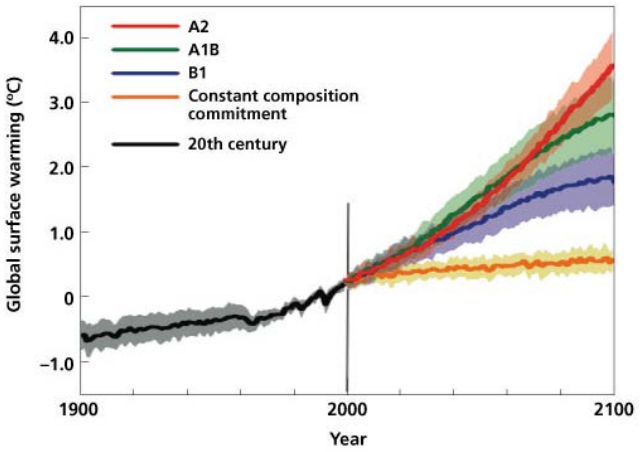

Figure 2: Global surface warming for scenarios A2, A1B and B1.
Source: IPCC Fourth Assessment Report 2007

Why should I consider adapting to climate change? continued

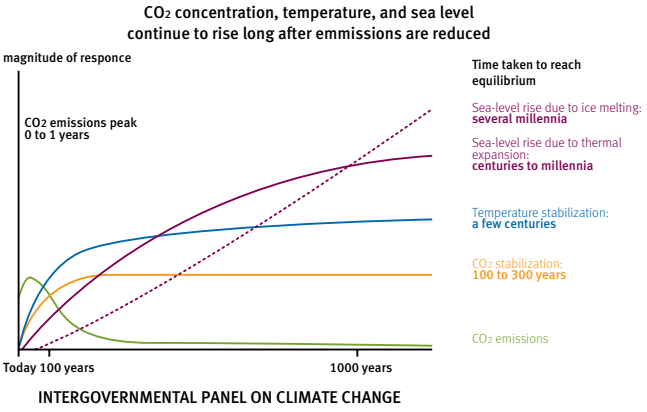

Figure 3: Projections of CO_2 concentration, temperature and sea level rise. Source: IPCC 2005

Figure 3 shows projections of atmospheric carbon dioxide (CO_2) concentrations, temperature and sea level rise for the next 1000 years.

Decision making on the basis of historic climate is no longer robust. Return periods for extreme weather events as well as average conditions are changing, so you may be caught out if using historic data. For example, if your flood defences are based on flood magnitudes with a 1:200 year frequency and floods of that magnitude begin to occur every 50 years, you will not be adequately prepared.

An increase in 1 or 2°C may not seem like a lot, but remember that average temperatures now are only 5°C higher than they were at the peak of the last ice age. Warming of 2°C could result in dangerous climate changes. The frequency and intensity of extreme weather events is also expected to change and in some cases increase. These changes could have disastrous consequences if no coping or adaptation measures are in place.

Planned adaptation is more effective than last minute, reactive adaptation. Many impacts will result from extreme weather events such as floods or storms rather than average changes in weather, and these are difficult to predict far ahead.

By the time you know what is happening, it may be too late to protect yourself and you could face unexpected costs relating to business disruption, reduced productivity, and the costs of repairing or replacing damaged premises or equipment. Small businesses take on average 50 days to recover from a flood and 69% have no business continuity plan, so disruption can be expensive.Planned adaptation is usually less expensive than responding to an emergency or retrofitting to cope with altered climate risks.

Government, insurers and investors are increasingly requiring that climate change be taken into account in decision making. So even if you think you are resilient to the direct impacts of climate change, you may be forced to address the issue by political, financial or legislative drivers such as the Climate Change Act (2008).

Adapting to climate change could provide immediate local benefits, enabling your organisation to cope better with current climate variability and extreme weather as well as future climate changes. Adapting to climate change could be good for your reputation. It could also open up new opportunities. If you fail to spot these, you might find yourself at a disadvantage compared to others in your field.

For further reading on the adaptation imperative see:

- *Contribution of Working Group II (Impacts, Adaptation and Vulnerability) to the IPPC Fourth Assessment Report* (particularly Chapters 17 and 19) http://ipcc.ch/publications_and_data/ar4/wg2/en/contents.html

- Final report of the *Stern Review on the Economics of Climate Change* http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/sternreview_index.htm

For information on why businesses should adapt to climate change, please see Climate Ready's web pages www.environment-agency.gov.uk/climateready and the Climate Ready publication *Be Climate Ready* http://www.climateweek.com/wp-content/uploads/2012/12/Be-Climate-Ready-Guide-for-Climate-Week-2013.pdf

Step 1. Getting started

The purpose of this step is to help you to:

- **articulate your motivations for considering adapting to climate change**
- **define your objectives**
- **assemble your team**
- **set in place any internal procedures or mechanisms needed to help you complete the assessment process**

Please work through this step with your colleagues, answering the questions posed of you. Ensure you complete the tasks in Questions 1.1–1.4. Some of the most important decisions in adaptation planning are made during this initial step and it is crucial that these decisions and the thinking behind them are articulated clearly.

1.1 Building blocks

There are a number of basic activities that need to be undertaken at the outset to help you get going and to ensure you get as much out of the process as possible.

- Read through the Wizard at a high level to ensure you have a sense of what the process involves and how you can maximise its value.
- Engage your colleagues. Gather a small team of people around you who can work with you throughout the process. Getting the right people on board from the outset will lead to a better product. Bear in mind that you will need to review this team as you move through the process as different skills sets and knowledge bases may be needed at different stages of the process. For example, the process of determining your vulnerability to recent weather (Step 2) will benefit from the perspectives of operational staff, while assessing the risk of potential impacts (Step 3) will benefit from involvement of those with management responsibilities. Also aim to match your team to the scope of your assessment. A broad and shallow assessment may need different individuals from one that is narrow and deep.
- Obtain senior management buy-in and support for this process. Completing the Wizard will have resource implications which may require the support or approval of senior management. Furthermore, the adaptation measures identified through the process are more likely to be implemented successfully if the process has high level support from the outset. Time spent in building support for climate adaptation at the inception of the process can be invaluable in delivering successful outcomes.

- The adaptation options you identify may initially be implemented through your organisation's existing procedures. Make sure you have a good understanding of these to help you look for ways of mainstreaming your adaptation measures later in the process.
- Consider how change can be affected in your organisation. Addressing some climate risks may call for a fundamental review of your organisation's activities and processes. Having a sense at the outset of how transformations might take place will help in the implementation phase.
- Familiarise yourself with the principles of good adaptation that underpin the assessment process.

Task 1.1

- Read through the Wizard, including About the Wizard.
- Assemble your team.
- Secure the necessary support to work through the Wizard.

1.2 What is your particular motivation for adapting to climate change?

There are several drivers for organisations considering adapting to climate change. Among the common motivations – or triggers – for taking action are:

- exposure to a recent extreme weather event such as a flood or heatwave (can be a very powerful driver for taking action as it heightens sensitivity to the issue and may raise concerns that climate change could exacerbate important risks such as reputational, health and safety, financial or operational).
- having responsibility for infrastructure and business areas that are sensitive to changes in climate.
- a requirement from government or a client.
- a desire to identify positive opportunities and gain an 'early mover' advantage over competitors.
- a wish to address adaptation as a next step after making good progress on mitigation.
- a desire to enhance your reputation and be seen as a market leader on climate adaptation.
- a need to maintain business continuity as a matter of strategic importance.
- a need to make decisions with long-term consequences (decades or longer) for land use, built assets or population groups.
- having someone with the skills, knowledge, motivation and leadership to engage the organisation in the issue and move it forward.

Make a note of the drivers that have encouraged your organisation or the people you work with externally to take action on climate adaptation. Being clear on why you are doing this will help you to articulate your objectives and intended outcomes.

Task 1.2: Articulate your motivation for considering adapting to climate change and ensure that this is captured in your records.

Resources to help you

- For more guidance on framing your problem and setting criteria, see Stages 1 and 2 of the 'Decision Making Framework' listed in the resources section of this document.

1.3 What do you want to achieve by using the Wizard?

You need to identify at the outset what the problem is that you are seeking to address, what it is that you intend to achieve and how will you be able to judge whether you have achieved what you set out to.

If your aim is to raise awareness of your colleagues or wider professional network, consider precisely what information is needed by whom and, more importantly, why it is needed. Ask yourself how you will measure whether information gaps have been addressed and whether that new knowledge is informing your activities.

If you are using the Wizard to make the case to senior management of the need to adapt to climate change and seek their support for further work, consider what information is needed to win their support.
If you are seeking to make a decision that is resilient to climate change, what criteria will be used to evaluate whether your decision will be robust in the face of climate change?

If you are developing an adaptation strategy for your organisation, decide on the appropriate scope and level of analysis required. Is a broad strategic view going to be most appropriate or would a more detailed assessment of one aspect of your organisation's activity, be more useful?

Make sure you have the right team of people involved to address the issue you are seeking to resolve.

Task 1.3: Establish what you intend to achieve.

Resources to help you

- Identify the problem you are seeking to address, and clarify your intended outcomes. This should include a decision regarding the scope and scale of your assessment, and make a record of the reasoning behind your decision in the Notepad.

- Establish in broad terms the criteria against which you may be able to judge a successful outcome. These success measures will be revisited and refined as you move through the process and will be actively employed in Steps 4 and 5, but develop your initial views at this stage to guide your thinking.

- Consider what timescales are most relevant to your assessment.

- Check that you have the right team of people involved to address the issue at hand.

Resources to help you

- or more guidance on framing your problem and setting criteria, see Stages 1 and 2 of the 'Decision Making Framework' listed in the resources section of this document.

- The UKCIP report, Attributes of Well-adapting Organisations www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Well_adapting_organisations.pdf (1.1MB) describes characteristics of organisations that are recognised as adapting well to climate change.

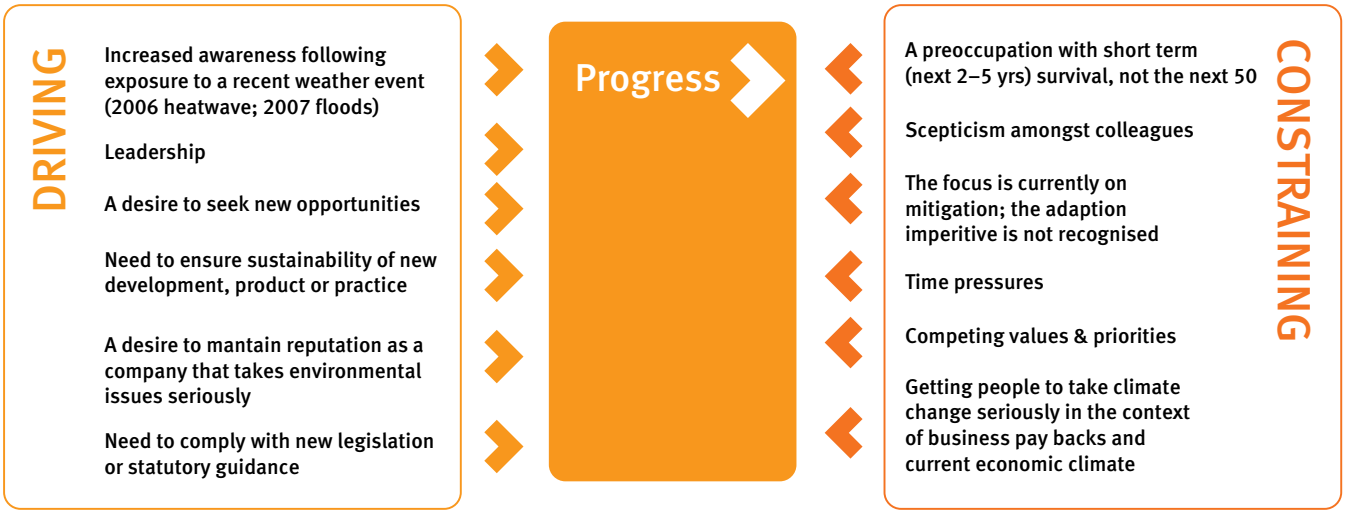

Figure 4: Drivers and constraints to progress. Image © UKCIP 2010

1.4 What difficulties might you face and how could they be overcome?

Common barriers to progressing adaptation action include:

- a lack of awareness or an unsupportive institutional environment
- scepticism
- conflicting priorities and time pressures which make it difficult to secure commitment to the process and can lead to long time delays
- a tendency to focus on the short term
- lack of technical information or limited availability of information
- resistance to changing what an organisation does, and how it does it

These barriers apply to both the business of completing the Wizard itself and to the actual implementation of adaptation measures that are identified as a result. Acknowledging and addressing these issues at the outset will help both to complete the assessment process, and implement your chosen adaptation measures.

Task 1.4: Identify barriers and means of overcoming them.

- Identify potential barriers and constraints to progressing adaptation within your organisation, and consider how they might be overcome. You may find the force field diagram in Figure 4 and in the Notepad, a helpful tool for this task. Ask yourself how you could minimise the effects of barriers and maximise the effects of drivers identified in Task 1.2 of the Notepad.
- Understand how your organisation works and how changes are usually implemented. Consider who needs to be involved, the context of your work, relevant regulations or legislation that influence your activities, performance targets and so on.

Check that you have engaged all those that need to be involved both within and beyond your organisation.

Resources to help you include

- work of the ESPACE (European Spatial Planning: Adapting to Climate Events) partnership www.espace-project.org on change management.
- the Government Office of the South West publication, Managing Change: How to manage change in an organisation www.oursouthwest.com/SusBus/mggchange.html – its Change Management Matrix is a particularly valuable tool for understanding change management.

Step 1 Checklist

At the end of Step 1 you should have:

- assembled your team
- secured management buy-in
- agreed on the scope and scale of your assessment
- articulated your motivation for taking action on adaptation
- clarified what it is you intend to achieve and understand how the Wizard can help you to achieve these
- identified potential barriers to action on adaptation and taken steps to overcome these

Step 1 Useful resources

- *A Changing Climate for Business* www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Business.pdf (2.5MB) provides an introduction to climate change impacts and adaptation for a business audience and includes some key messages for business.
- Stages 1 and 2 of the UKCIP risk and uncertainty in decision-making framework www.ukcip.org.uk/wordpress/wp-content/Wizard/risk_stages_1_2.pdf provide helpful guidance on objective setting, problem identification and on establishing decision-making criteria.
- Identifying Adaptation Options provides a good overview of climate change adaptation. This tool can be found on the Climate Ready web site in the Practical Resources section www.environment-agency.gov.uk/climateready
- *Managing Adaptation: Linking Theory and Practice* www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Managing_adaptation.pdf (5.8MB) examines key issues to consider when making the transition from awareness to action.
- *Attributes of Well-adapting Organisations* www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Well_adapting_organisations.pdf (1.1MB) describes characteristics of organisations that are recognised as adapting well to climate change.
- The work of the ESPACE partnership www.espace-project.org on change management provides useful insights into overcoming barriers to engagement.
- The Government Office of the South West publication, *Managing Change: How to manage change in an organisation* www.oursouthwest.com/SusBus/mggchange.html, provides useful insights into potential barriers to action and how to overcome them.
- 'A Brighter Outlook', an article by climate change adaptation consultant, Alex Harvey, in the April 2010 issue of Sustainable Business magazine www.ukcip.org.uk/wordpress/wp-content/Wizard/Business_case.pdf (500KB) summarises the adaptation imperative and the simple steps companies can take to prepare for climate risks.
- Other tools and information which you may find useful can be found in the Resources Section on the Climate Ready website. www.environment-agency.gov.uk/climateready

Step 2. Assess your vulnerability to the current climate

Step 2 will help you to assess your vulnerability to current climatic variability.

This will make it easier for you to consider how future climate change might affect you (Step 3) and could reveal responses to past events that may also be appropriate adaptations to future climate (to be considered in Step 4). It will also generate stories relating to past impacts that may be useful for raising awareness and engaging colleagues.

In this step, you will identify how particular types of weather have affected your organisation in the past and what the consequences of those weather events were. Where possible, critical thresholds[6] will be identified which, when exceeded, brought unacceptable losses to your organisation – or opened up a new opportunity. You will also be asked to evaluate how well your organisation coped with those events in the past, and consider how characteristics of your organisation or the event itself, influenced that response.

[6] 'The point in a system at which sudden or rapid change occurs' (Source: UKCIP Glossary).

2.1 How have previous weather events affected your organisation?

Answering this question will help you determine your sensitivity to current weather and consider how important climate risks could be to your organisation in the future.

Think about how average climate, such as seasonal temperature and rainfall, currently affects you. Also consider the effects of extreme weather such as heavy rainfall, coastal flooding, droughts, very hot days and storms. How were you affected, for example, by the floods of the summer of 2007, the hot summers of 2003 and 2006, or the snow and subsequent ice melt in early 2010? Were any critical thresholds passed during these events that had an impact on your operations? What were the consequences of those weather events for your organisation and what actions were taken to address these consequences?

- Do not assume you are not vulnerable if the effects of weather impacts are not immediately obvious. Vulnerability to weather and climate can often be hidden within an organisation, or managed or tolerated in a way that masks its effects.

- Completing the task below in collaboration with colleagues – particularly operational staff and long-standing employees with institutional memory – and, where appropriate, affected stakeholders, will help tease out these sensitivities. A brainstorming workshop and reference to relevant company records should yield the requisite information.

Task 2.1: Assemble a profile of your organisation's sensitivity to current weather variability by completing columns (a) to (g) in Table 2.1.

- Describe past weather events that have affected your organisation. Where possible, describe the specific details of each particular weather event that had consequences for your organisation.

- Identify the consequences of those weather events for your organisation, quantifying these as far as possible.

- Identify any critical thresholds or assessment endpoints that could be exceeded as a consequence of specific weather events. Examples include a wind speed above which operations have to stop for health and safety reasons, a temperature threshold above which staff performance or customer complaints increase significantly, and a point at which quality of service fines may be imposed.

- Make a note of your source of information and the confidence you attach to it. For example, you may draw on journalistic sources or on your organisation's own records, and you may have greater confidence in one source of information than another.

- Identify which records could be analysed further to enrich your organisation's understanding of the impacts of past events and allocate a responsible person to undertake this analysis.

- Identify which records could be monitored in an on-going basis as part of your emerging adaptation strategy. This information will feed into Steps 4 and 5.

Resources to help you

- Information on past weather events is given in UK observed climate change trends reports http://ukclimateprojections.defra.gov.uk/22539 and *An Online Handbook of Climate Trends across Scotland* www.climatetrendshandbook.adaptationscotland.org.uk/index.html.

- The Met Office Hadley Centre monitors a broad range of climate variables and indices worldwide for climate monitoring and climate modelling work, producing gridded observation datasets www.metoffice.gov.uk/climatechange/science/monitoring/ukcp09/. UK monthly summary and climate averages are available.

2.2 How well did your organisation cope?

The capacity of your organisation to cope with adverse weather defines its level of vulnerability to the changing climate. Vulnerability has been defined by the Inter Governmental Panel on Climate Change (IPCC) as 'the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes'. Vulnerability is thus a function of your organisation's exposure to climate hazards, sensitivity to climatic variability and capacity to adapt.

An organisation may be exposed to climate hazards, but if excellent coping mechanisms are in place, it is unlikely to be particularly vulnerable to those hazards. Conversely, an organisation that on the face of it has limited exposure to climate hazards could be vulnerable if inadequate coping mechanisms are in place to deal with unexpected events.

Identifying and assessing the effectiveness of mechanisms already in place to cope with existing climatic variability will provide critical insights into the improvements or changes that may be required to enhance your capacity to adapt to future climate change and so provides a useful input to Step 4.

Task 2.2: Assess how well your organisation coped with extreme weather events in the past and make a judgement on your organisation's capacity to respond to weather disruption. Enter responses to questions into Table 2.1.

- Identify actions taken to deal with past weather events (in column (h) of Table 2.1).
- Describe how effective or otherwise those actions were (column (i) of Table 2.1).
- Consider what characteristics or features of your organisation facilitated its ability to cope with that event. These may include, for example, strong leadership, well-established working from home policies and practices, effective business continuity management, good emergency and contingency plans and so on. Record these characteristics in the Notepad.
- Make a note of obvious gaps, omissions or features of the organisation that hindered its response. These could be financial, institutional, cultural, organisational or other. Understanding what prevented an adequate response will immediately suggest adaptation actions that could be considered more fully in Step 4.

2.3 Is it possible to identify any critical thresholds?

In order for you to manage your climate risk to a level that is acceptable to you, it would help if you could identify the critical thresholds for your activity, which, if exceeded, will cause unacceptable consequences. A changing climate could mean that a critical threshold will be exceeded more frequently than in the past and you will need to adapt to manage your risks to a level that is acceptable to you, taking into account your attitude to risk.

Thresholds may be a natural property of your system (for example, the water level at which a river bursts its banks, a temperature threshold above which machinery cannot operate effectively) or may be socially constructed based on risk attitude (for example, the 1 in 200 year return period standard for coastal floods).

Critical thresholds may also relate to positive opportunities and not just to threats. For instance, research has suggested that when monthly average daytime temperatures exceed 18°C, drinkers switch from other alcoholic beverages to cider resulting in a marked increase in cider sales.

Task 2.3: Where possible, identify critical thresholds.

- Re-visit Table 2.1 and make sure you have recorded critical thresholds for specific events as far as is possible. Don't forget to capture opportunities as well as threats. If you have this information expressed as a monthly or seasonal average as in the example above, you will be able to use UKCP09 in Step 3 to help quantify your climate risks.

- If necessary, contact third parties or draw on specialist outside knowledge to obtain the information you need on critical thresholds.

Resources to help you

- Information on past weather events is given in UK observed climate change trends reports http://ukclimateprojections.defra.gov.uk/22539 and *An Online Handbook of Climate Trends across Scotland* www.climatetrendshandbook.adaptationscotland.org.uk/index.html.

2.4 How confident are you in this assessment?

Be explicit about the quality and validity of the information on which your assessment is based. If your analysis is based on uncertain or anecdotal information, note any limitations that apply. Also be explicit about any assumptions you have made so that others can make sense of the outputs and the thinking behind it.

Find out more about any important issues that have emerged in this step.

Tools to help you

- Guidance for Uncertainty Assessment and Communication http://leidraad.pbl.nl/ – select the English version of the website) prepared by the Netherlands Environmental Assessment Agency (MNP) in mapping and communicating uncertainties in environmental assessments may be helpful in structuring your consideration of uncertainty (registration may be required).

- Guidance www.nusap.net prepared by the National Institute for Public Health and the Environment (RIVM) in the Netherlands on assessing and handling uncertainty is also a rich source of information and is recommended reading.

Step 2 Checklist

After working through this step you will have:

- identified how particular types of weather have affected your organisation in the past, what the consequences of those weather events were, and what actions were taken as a result

- where possible, identified critical thresholds which, when exceeded, caused unacceptable losses to, or created new opportunities for, your organisation

- considered the effectiveness of your organisation's response to past weather events and what features or characteristics of your organisation that influenced its capacity to respond

- an awareness of the key uncertainties associated with your analysis, as well as the quality of the information on which it is based

- a record of your answers, and any related discussions, to the questions posed in this step

Step 2 Useful resources

- The UK Climate Change Risk Assessment www.defra.gov.uk/environment/climate/government/risk-assessment/ contains useful information on the impacts of past events.

- The UKCP09 Threshold Detector http://ukclimateprojections.defra.gov.uk/22587 can help you explore critical thresholds.

- Information on past weather events is given in UK observed climate change trends reports http://ukclimateprojections.defra.gov.uk/22539 and *An Online Handbook of Climate Trends across Scotland* www.climatetrendshandbook.adaptationscotland.org.uk/index.html

Step 3. Assess your vulnerability to future climate change

Step 3 contains information on how the UK's climate is expected to change and will help you to assess how those climatic changes could affect you.

In this step you will conduct a qualitative risk assessment to identify your high level climate risks and compare the relative importance of these climate risks with other non-climate related risks affecting you. You will then use this information to identify priority climate risks that require an adaptation response.

3.1 How is the UK's climate expected to change?

Over the coming century we generally expect that:

- the UK will continue to get warmer
- summers will continue to get hotter and generally drier
- winters will continue, on average, to get milder and wetter
- sea levels will continue to rise along much of the coastline

The UK will continue to experience a very variable climate in the future. So, whilst we generally expect summers to be drier, we should still plan on having some wet ones. As well as changes in average climate, there will be changes in climatic extremes. Some weather extremes such as very hot days and intense downpours of rain will become more common. Others, such as snowfall, will become less common.

Extreme events are by definition rare, but they often have the most significant impacts. Unfortunately, they are also difficult to predict and so information on future climate extremes is less certain.

3.2 What are the key climate impacts on my area of responsibility?

Much information has been generated over the years to help you answer this question.

- For sector-specific information, consult the sector-specific pages of the Climate Ready website www.environment-agency.gov.uk/climateready.
- For sub-UK climate impacts information refer to Climate UK www.climateuk.net.
- The Climate Change Risk Assessment www.defra.gov.uk/environment/climate/government/risk-assessment/ offers a national overview of key climate risks to the UK.
- Additional tools and resources can be found in the Resources Section on the Climate Ready website. www.environment-agency.gov.uk/climateready

In addition, you may wish to carry out a simple assessment to identify potential climate impacts on your organisation or activity based on your collective experience.

Task 3.1: Familiarise yourself with resources available in UKCP09 to explore how the climate of the UK is expected to change in future.

- Establish what level of detailed climate information you need and make a note of the reasons for selecting a particular level of information. For example, headline messages may be sufficient for those conducting a high-level qualitative risk assessment but others looking or a more quantitative assessment may require greater detail.

- Select the climate change projection that best suits your application. For guidance on how to do this, see the UK Climate Projections website http://ukclimateprojections.defra.gov.uk. Record the reasons for selecting your chosen projection(s) in the Notepad.

Resources to help you

The latest climate change information for the UK is provided by UKCP09 http://ukclimateprojections.defra.gov.uk/ The following UKCP09 resources will help you to complete this activity.

- **What is UKCP09?** http://ukclimateprojections.defra.gov.uk/21678 describes attributes of UKCP09 and some of the potential benefits it offers, as well as some of the guiding principles that apply to its development and use.

- **Maps and key findings** http://ukclimateprojections.defra.gov.uk/21708 provide an overview of the main changes described by UKCP09 for the UK as a whole and for each of the 16 administrative regions in the UK. Projected temperature and precipitation changes for the 2020s, 2050s and 2080s are available under the High, Medium and Low emission scenarios and at 10, 50 and 90% probability levels. The maps and graphs pages contain a series of maps and graphs that are useful for visualising projected changes.

- **Reports and guidance** http://ukclimateprojections.defra.gov.uk/22530 provides links to the suite of reports published to cover the various components of UKCP09.

- **The briefing report** http://ukclimateprojections.defra.gov.uk/22536 contains a summary of the 2009 UK Climate Projections (UKCP09), consolidating the scientific reports for the general reader as well as describing the methodology and some key projections of future climate change for the UK over the 21st century.

- **The climate change projections report** http://ukclimateprojections.defra.gov.uk/22537 is designed for those who wish to find out more about the purpose and design of the UKCP09 methodology for producing the probabilistic projections of climate change, and is drafted to suit a range of levels of expertise.

- **The Weather Generator report** http://ukclimateprojections.defra.gov.uk/22540 introduces the UKCP09 Weather Generator and outlines the need for it, its principles and how it can be used.

- **The marine and coastal projections report** http://ukclimateprojections.defra.gov.uk/22530 provides an overview of marine change around the UK, showing key findings and detailing the science used.

- Customisable output is available from the UKCP09 user interface http://ukclimateprojections-ui.defra.gov.uk/ui/admin/login.php. Please note you will be asked to register to access this site.

Note: When major investment in long-term infrastructure is being considered, you are advised to look wider than just the UKCP09 projections and to consider the changes described for the UK by other climate modelling centres. For example, the results from other IPCC models can be viewed using the IPCC Data Distribution Centre data visualisation tools www.ipcc-data.org/ddc_visualisation.html.

Task 3.2: Conduct a simple assessment to identify potential climate impacts by completing Table 3.2**.**

1 Refer to Table 2.1 to identify the key climate variables that most affect your organisation, and enter these into column (a) of Table 3.2. If you have sufficient information to describe a particular event, or threshold, enter that into column (b). You may also wish to consider those that could become problematic in future, but which don't presently affect you.

2 Make a note in column (c) of the projection, time slice and probability level you are basing your assessment on, particularly if you are using climate projections beyond the headline messages. Describe how the behaviour of those climate variables in column (a) – and (b) if applicable – are expected to change in future in accordance with your chosen projection(s). Capture this information in column (d) of Table 3.2. Introduce additional columns, or create additional tables, if a series of projections is being considered. When selecting the timescale for your assessment, think about the longevity of your assets and the timescales that apply to the decisions you are making, as well as the lead-in required to change direction or implement new actions.

3 Identify the exposure units[7] and receptors[8] at risk. Businesses may find it helpful to structure this task around the BACLIAT tool, which identifies six generic business areas (people, premises, processes, markets, logistics and finance). Consider how each business area might be affected by changes to the variables being considered.

4 Identify negative impacts (threats) and positive impacts (opportunities) that could result from future climate change. Record these impacts in columns (f) and (g) of Table 3.2 respectively. Note whether any critical thresholds are likely to be crossed or assessment endpoints reached under the projected future climate and note the consequences that could arise. Quantify your description of potential impacts and consequences as far as possible.

Resources to help you

5 BACLIAT will help you consider potential impacts on business areas in a systematic way. This can be found on the Climate Ready website in the practical resources section. See www.environment-agency.gov.uk/climateready practical resources.

The results of this exercise will be shaped by your own experiences and knowledge. Don't forget to work in partnership with colleagues to ensure you have as complete a picture as possible of the impacts, threats and opportunities posed by changing climatic conditions.

[7] 'Represents the system considered to be at risk, and may be defined in terms of geographical extent, location and distribution of a variety population of receptors at risk' (Source: UKCIP Glossary).

[8] 'Receptors represent important aspects of the exposure unit. In some cases, the exposure unit and receptor may be synonymous' (Source: UKCIP Glossary).

3.3 Are there indirect climate impacts that need to be considered?

Some indirect impacts may have emerged in the exercise in Step 3.2 above, but explicitly considering indirect impacts will help ensure you don't miss out something very important.

Also ask yourself whether there could be any knock-on effects. For example, the UK tourist industry stands to gain from a longer tourist season and more reliable summer weather. However, increasing numbers of tourists would increase demand for water at a time of decreased water availability.

There may also be other non-climate factors such as industry or market trends that could indicate new threats or opportunities that are not an issue under current conditions. For example, telecoms companies may wish to consider the sensitivity of optical fibres to weather and climate in recognition that this technology is expected to be in widespread use in the future.

Task3.3: Identify any indirect climate impacts, knock-on effects and impacts that could become important due to non-climate factors and enter these into Table 3.2.

Resources to help you

- Checklist of risk categories based on HM Treasury's Orange Book www.hm-treasury.gov.uk/d/orange_book.pdf (430 KB)

Remember that if you work in partnership with others inside and outside of your organisation, you are more

3.4 What risks do these climate impacts present?

Once you have identified the likely positive and negative impacts on your organisation, and the threats and opportunities they represent, you need to determine the risk each of those potential impacts presents to you. Figure 5 summarises the possible types of risk you might need to consider.

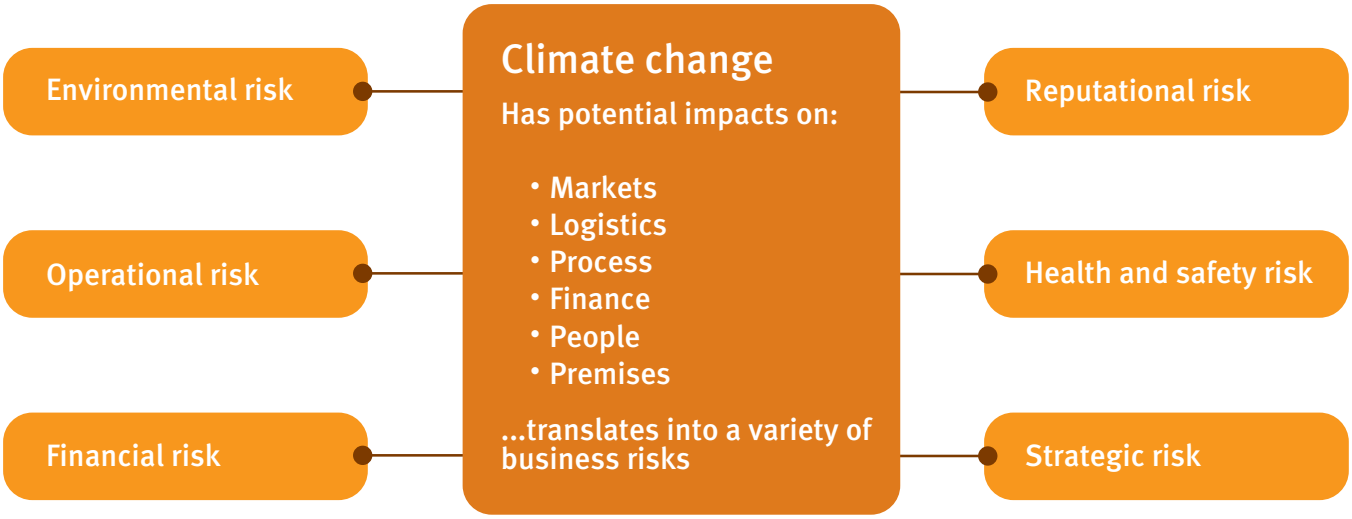

Figure 5: Possible business risks from climate change. Image © UKCIP, 2010

Step 3 continued

A risk assessment involves assessing:

1 The probability, or likelihood, of the impact occurring

2 The magnitude, or consequence, of the impact should it occur

The product of these factors represents risk:

Probability of occurrence x Consequence of occurrence = Risk

Impacts that are highly likely to occur, and which would have serious consequences if they did occur, would be considered high risk, high priority impacts and would fall into the red, top right corner of Figure 6. Insignificant impacts that are unlikely to occur would present little risk and would fall into the green, lower left corner. You now need to determine what risk is posed to you by each of the impacts you have identified.

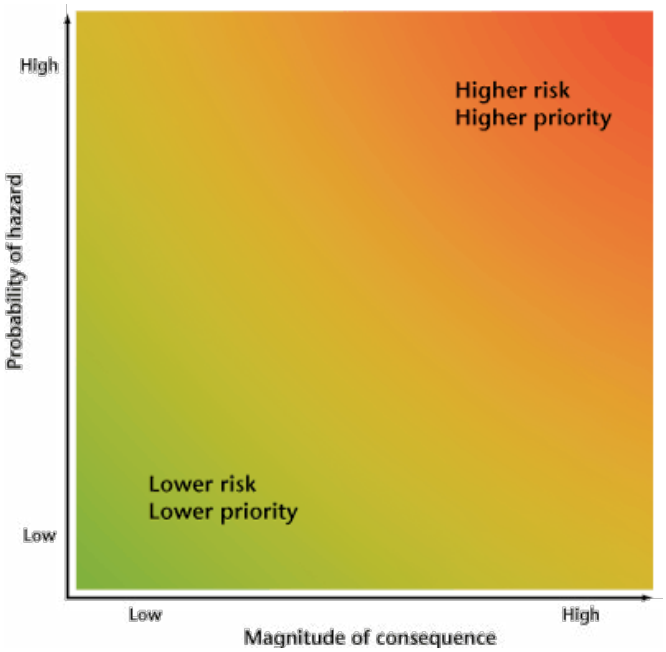

Figure 6: Risk as a function of probability and consequence.
Image © UKCIP, 2003

There are several approaches to risk assessment. Your organisation will probably have its own in-house risk assessment methods, in which case you should use these. If you are new to risk assessment, you could complete the following process to help you to conduct a very simple and qualitative assessment of climate risks. For more comprehensive treatment of risk assessment refer to the 'Decision Making Framework' listed in the resources section of this document.

If you are making an important investment decision or designing a major project, you will need to carry out a formal risk assessment. The high level approach presented here will not be adequate for your purposes.

It is important to assess the degree of risk each impact presents today as well as for your chosen future time periods. This is because some risks might diminish with time while others might increase, either because the nature of the climate hazard is expected to change (for example, less winter snowfall or more flash flooding) or your exposure is expected to change. If you expect your exposure to decrease, make sure you document your reasoning: the actions or factors that you expect will reduce your exposure will only be realised if you take positive steps to make them happen. These actions are adaptation options and should be included in your options identification task in Step 4.1.

Even if your organisation is not directly sensitive to climate, you could still be indirectly affected if climate impacts on your other risk areas. Therefore in some cases, climate impacts may not represent a new set of risks but will be an input factor in determining the level of general risks already identified.

Task 3.4: Assess the likelihood and consequence, or risk, of each impact listed in Table 3.2 **for the present day and for your chosen future time period(s), completing** Table 3.4.

- Table 3.4 provides a template for your risk assessment. Populate column (h) with the long list of threats from Step 3.2, then work steadily through the steps below to complete the assessment.
- Consider the likelihood of each threat occurring and the magnitude of its consequences for your organisation should it occur, For each threat, assign a value of 0–5, or low, medium and high for(a) the likelihood of an impact occurring and (b) the magnitude of its consequence should it occur, and enter the value into your matrix.
- If you have a very high number of threats to evaluate, consider only mapping those with high consequences in the first instance. If you do, ensure you record this decision so that no risks are lost to the process – though some may not be consequential now, they could become so in future as circumstances change. In assigning these values, consider the climate risk based on the current climate (refer to your answers in Step 2.2) and projected changes in climate over the life time of the decision which you are making.
- Determine the risk by multiplying the likelihood of impact by the magnitude of consequence for each impact. Enter this value into your table.
- Sort the table by the Risk column, or plot the risks into a 'heat map' (see Figure 6) to visualise your priority climate risks.
- It is crucial that you make a note of the thinking behind your risk ratings and that your assumptions are absolutely transparent so the work can be continually reviewed. Also be explicit about whether your risk ratings assume a degree of incremental adaptations will take place. Beware of assuming that threats won't materialise because your organisation will adapt in time and 'won't let it happen'. You will only adapt if you identify the threats and respond appropriately and in good time.
- Note that your risk assessment will be influenced by your risk attitude. Where possible, make a note of the amount of climate risk you are prepared to tolerate.
- If appropriate, estimate the costs of particular impacts by drawing on what you know about the costs of past events. This information could be important in considering your risks and aiding your assessment of adaptation options in Step 4.2.
- Make a plan to find out more about any risks you need to understand better.

Resources to help you

- The Cabinet Office initiative, UK Resilience www.cabinetoffice.gov.uk/ukresilience, has a wealth of information on risk assessment on its website.
- For general guidance on designing effective risk matrices, see the work of the ioMosaic Corporation www.iomosaic.com/solutions/srms.aspx.

3.5 Will climate risks be more or less important than others?

For many organisations, climate risk is just one of a number of risk factors that need to be addressed. Consider the relative sensitivity of your decision to climate and non-climate risks so that the measures you take are reasonable and proportional to the range of risks posed.

Task 3.5: Draw up a list, or table, of the non-climate risks affecting your activity.

- Complete a matrix as in Step 3.4 from which you can compile a rank ordered list of non-climate risks against which you can compare the climate risks affecting your decision.

- Bear in mind the uncertainties associated with your findings and consider the confidence you can place in your findings, even if a more quantitative assessment of your risk may not yet be possible.

Resources to help you

- The checklist of risk categories may help you to think about the full range of risks you face (for example, reputational, financial).

- Bear in mind that the significance of other risks may change over time. So, alongside climate change projections, draw on your understanding and experience of your sector to consider existing and future trends that might affect your operations, for example, in the product or labour market, or changing technologies

Checklist of risk categories

Category of risk	Relating to...
External	
Infrastructure	Infrastructure such as transport systems for staff, power supply systems, suppliers, business relationships with partners, dependency on internet and email
Economic	Economic factors such as interest rates, exchange rates, inflation
Legal and regulatory	Laws and regulations which if complied with should reduce hazards (e.g. Health and Safety at Work Act)
Environmental	Issues such as fuel consumption and pollution
Political	Possible political constraints such as change of government
Market	Issues such as competition and supply of goods
Act of God/natural perils	Issues such as fire, flood and earthquake
Financial	
Budgetary	Availability of resources or the allocation of resources
Fraud or theft	Unproductive loss of resources
Insurable	Potential areas of loss which can be insured against
Capital investment	Making appropriate investment decisions
Liability	Right to sue or to be sued in certain circumstances

Checklist of risk categories: continued

Category of risk	Relating to...
Activity	
Policy	Appropriateness and quality of policy decisions
Operational	Procedures employed to achieve particular objectives
Information	Adequacy of information used for decision making
Reputational	Public reputation of the organisation and consequential effects
Transferable	Risks which may be transferred Transfer of risks at inappropriate cost
Technological	Use of technology to achieve objectives
Project	Project planning and management procedures
Innovation	Exploitation of opportunities to make gains
Human resources	
Personnel	Availability and retention of suitable staff
Health and safety	Well-being of people

Source: HM Treasury's Orange Book www.hm-treasury.gov.uk/d/orange_book.pdf (430KB)

3.6 What are the priority risks that require an adaptation response?

Having completed Steps 3.4 and 3.5, your organisation's priority climate risks should now be clear. Make sure you have captured these all by trying to identify:

- high order risks that you face already
- risks that will increase most rapidly due to climate change, especially if they cross some critical threshold
- risks where it will take some time to plan and implement your adaptation response
- where you want an early-mover advantage on a climate change business opportunity
- where there is a complementary non-climate driver for taking action such as health and safety, mitigation, reputation or achieving a better work-life balance

Task 3.6: Identify the most significant risks from the matrix developed in Step 3.4**.**

Sort your **risk** matrix on the **risk** column, or draw a line across a **heat map** (like the one in Figure 6). Those that fall into the top right region of your chart will be of greater priority than those in the lower left region.

Proceed to Step 4 to identify, evaluate and implement adaptation options to address your priority risks that require an adaptation response.

3.7 Do you need to find out more?

If you need to develop a deeper understanding of your vulnerability to certain risks before you can decide how best to adapt, find out more about these risks while you formulate your response to significant risks already identified in Step 3.6. Do not let a requirement for further information about some risks be a barrier to adaptation action on other risks.

Quantify the climate risks you face and establish how much these might cost by conducting a desktop study by in-house experts or commissioning experts to help. Given the context specific nature of any such analysis, guidance from the Wizard is limited here to highlighting key issues which ought to be considered and signposting to other tools that can help.

Option A: Analyse your key climate risks in detail by conducting further work internally or in collaboration with external consultants.

Remember to think about non-climate risks that your system faces, so you can take a balanced approach to managing climate and non-climate risks.

Resources to help you

- Various regional and sector-specific studies will be a useful starting point www.ukcip.org.uk/resources
- Tools and resources can be found in the Resources Section on the Climate Ready website www.environment-agency.gov.uk/climateready
- The Climate Change Risk Assessment www.defra.gov.uk/environment/climate/government/risk-assessment/ provides a rich source of information including evidence collected from 11 sectors or research areas.

Option B: Commission experts, or appoint internal staff, to determine how much climate impacts could cost.

Resources to help you

- The costings methodology listed in the resources section of this document, can be used to convert significant risks – and opportunities – into financial costs. Technical and relatively simple versions of the methodology are available, depending on the importance of this information to your decision making.

- If neither tool is appropriate, estimate the costs yourself based on previous experience. This could include costs incurred through replacing or repairing damaged equipment, or from lost business. For example, flooding of the BMW plant at Cowley, Oxford, in 2005 resulted in 50 fewer cars being produced, which represented tens of thousands of pounds of lost turnover.

- The costings methodology was used to develop case studies estimating the costs of climate change adaptation and give ballpark figures for some key sectors.

  - London www.ukcip.org.uk/wordpress/wp-content/PDFs /London_tech.pdf

  - West Midlands www.ukcip.org.uk/wordpress/wp-content/PDFs /WM_tech.pdf

As in previous steps of the Wizard, make an explicit note of the assumptions and judgements made in your assessment, the source of the information you have used, and the confidence that you place in it.

Step 3 Checklist

After working through this step you should have:

- an understanding of how the UK's climate is expected to change
- conducted a qualitative assessment to identify key climate impacts on your area of interest, or assembled information from other sources
- identified non-climate impacts and compared the relative importance of climate and non-climate impacts
- determined what risks those climate impacts pose to you and how important they are in relation to other risks
- identified your priority climate risks that require an adaptation response
- an awareness of uncertainties associated with the information you are using
- recorded your answers to all the questions and documented your discussions

Step 3 Useful resources

- *Measuring Progress* provides an overview of results from studies conducted in the first seven years of UKCIP. www.ukcip.org.uk/wordpress/wp-content/PDFs /MeasuringProgress.pdf (1.6MB)
- The BACLIAT tool could help you to identify climate risks to your business area or activity. This can be found on the Climate ready web site in the practical resources section www.environment-agency.gov.uk/climateready
- The UKCP09 projections provide detailed guidance on how climate might change in future. http://ukclimateprojections.defra.gov.uk
- ioMosaic Corporation's website offers useful information on designing an effective risk matrix. www.iomosaic.com/solutions/srms.aspx
- The Cabinet Office initiative, UK Resilience, has a wealth of information on risk assessment on its website. www.cabinetoffice.gov.uk/ukresilience

Step 4. Identify, assess and implement adaptation options

Having identified your significant climate risks you need to determine how best to address them. You may find that some ideas have already been captured in the course of completing Steps 2 and 3.

This step will help you to identify a range of adaptation options more systematically, choose preferred adaptation options using explicit criteria, and put together a programme for action to implement your chosen adaptations.

This work should proceed in parallel with your finding out more about any less well understood risks.

For an example of Step 4 in action, see the Severn Trent Water case study www.ukcip.org.uk/wizard/wizard-case-studies/severn-trent-water/

4.1 Identify a range of adaptation options

Adaptation actions aim to manage your climate risk to an acceptable level and enable you to take advantage of any positive opportunities that may arise.

Two broad categories of planned adaptation may be recognised: building adaptive capacity (BAC) and delivering adaptation actions (DAA). In practice this distinction is somewhat artificial as many capacity building actions are indeed tangible adaptation actions, but distinguishing between the two can stimulate broad thinking around options.

Building adaptive capacity (BAC) involves developing the institutional capacity to respond effectively to climate change. This means compiling the information you need and creating the necessary regulatory, institutional and managerial conditions for adaptation actions to be undertaken. BAC activities include:

- gathering and sharing information (for example, undertaking research, monitoring data and company records, and raising awareness through education and training initiatives)
- creating a supportive institutional framework (changing standards, legislation, and best practice guidance, and developing appropriate policies, plans and strategies)
- creating supportive social structures (changing internal organisational systems, developing personnel or other resources to deliver the adaptation actions, and working in partnership)

Delivering adaptation actions (DAA) involves taking practical actions to either reduce vulnerability to climate risks or to exploit positive opportunities, and may range from simple low-tech solutions to large scale infrastructure projects. DAA can include:

- accepting the impacts, and bearing the losses that result from those risks (for example, manage retreat from sea level rise)
- off-setting losses by sharing or spreading the risks or losses (for example, through insurance)
- avoiding or reducing one's exposure to, climate risks (for example, build new flood defences, or change location or activity)
- exploiting new opportunities (for example, engage in a new activity, or change practices to take advantage of changing climatic conditions)

Another way of considering adaptation options is to think of the types of actions that can be taken. These may be:

- temporary (for example, use large umbrellas to reduce solar heat gains)
- managerial (for example, introduce flexi-time, facilitate working from home)
- technical (for example, refurbish a building, enhance flood defences)
- strategic (for example, commission new building with climate-resilient design as part of planned capital building programme)

Task 4.1: Identify a long list of adaptation options.

- Extract all the options that emerged in Steps 2 and 3 and include them in a table of adaptation options.
- Hold a brainstorming workshop with relevant colleagues from within and outside your organisation to generate a 'long list' of adaptations that could be taken to address the climate risks identified in Step 3.
- Draw on the experience of other countries and other organisations in your locality or sector, and consider whether these are transferrable in time and space to your situation.
- Aim to identify a range of adaptation options that can be implemented individually or collectively. These may be:
  - **no-regrets options** that will deliver benefits that exceed their costs, whatever the extent of climate change
  - **low-regrets options** that would yield large benefits for relatively low costs and seek to maximise the return on investment when certainty of the associated risks is low
  - **win-win options** that enhance your adaptive capacity while also contributing to the achievement of other social, environmental or economic outcomes
  - **flexible or adaptive management options** which will enable you to put in place incremental adaptation options.
- Note that a decision to delay the implementation of an adaptation measure can also be a legitimate risk management strategy if you use that time to find out more about key risks and options.
- Similarly, a conscious decision to 'do nothing' MAY be legitimate and appropriate in the case of low priority impacts or in situations where climate risks are outweighed by non-climate factors. However, a decision to do nothing should not be the default position and should only be reached after careful consideration of your climate risks and adaptation options. Such a decision must also be continually monitored and reviewed to ensure nothing has changed that requires you to change your position.
- Think creatively so as not to limit your options. At this stage, there can be no 'wrong answers'.

Resources to help you

- See the Climate Ready case studies for examples of how some organisations in the UK are already adapting to climate risks.
- For specific information on how adaptation can be integrated into the planning, design and development of new and existing communities, see the Town and Country Planning Association guide, *Climate Change Adaptation by Design* www.ukcip.org.uk/wordpress/wp-content/PDFs/LA_pdfs/CC_by_design.pdf (5MB) and the Three Regions Climate Change Group Checklist for development www.ukcip.org.uk/wordpress/wp-content/PDFs/Checklist_for_development.pdf (512KB)
- *Beating the Heat: Keeping UK buildings cool in a warming climate* www.ukcip.org.uk/wordpress/wp-content/PDFs/Beating_heat.pdf (7.4MB) contains some good worked examples of adaptations to specific building types.
- Section 10.3 of *Preparing for Local Climate Change: A Guidebook for Local, Regional and State Governments* www.ukcip.org.uk/wordpress/wp-content/Wizard/snoveretalgb574.pdf (5MB) provides examples of adaptation actions that might be taken by local authorities to meet sector specific adaptation objectives.
- The types of adaptation strategy table can be used to stimulate thinking on the range of possible adaptation strategies.

Types of adaptation strategy

Adaptation strategy type	Notes
Use of risk-based policy and project appraisal process and techniques	Proactive. Organisations that adopt risk assessment will be more flexible and better able to cope with climate risks.
Delay and buy-time	Proactive. A delay strategy can help to deliver a better decision if the delay time is used to improve your knowledge – for instance by combining it with research or monitoring.
Research	Proactive or strategic. Use research to better understand climate risks and performance of adaptation options.
Monitoring	Proactive: system performance monitoring. Reactive: climate impact monitoring.
Information supply, education, awareness-raising	Proactive or reactive. Can be used to raise awareness of the need to adapt.
Contingency planning	Strategic planning for low probability, high consequence events.
Diversification or bet-hedging	Proactive technical or policy response.
Insurance	Proactive, fiscal response.
Defend and manage	Proactive or reactive technical measures.
Change of use	Proactive or reactive. Includes planning responses, with or without technical measures.
Retreat and abandon	Proactive or reactive. Includes strategic planning response.
Safety factors, climate headroom, buffering measures	Proactive or strategic. Includes technical and regulatory response.

4.2 Evaluate your adaptation options

A set of the criteria is needed against which you can evaluate the ability of each option to achieve your strategic objectives. Your organisation may have an established list, in which case you should use those. If not, draw from the set below to evaluate your options:

- Effectiveness – will the actions meet your objectives?
- Efficiency – do the benefits exceed the costs?
- Equity – the action should not adversely affect other areas or vulnerable groups
- Flexibility – is the action flexible and will it allow for adjustments and incremental implementation?
- Sustainability – does the action contribute to sustainability objectives and are they themselves sustainable?
- Practical – can the action be implemented on relevant timescales?
- Legitimacy – is the action politically and socially acceptable?
- Urgency – how soon could the action be implemented?
- Costs – consider social and environmental costs, not just economic
- Robust – is the option robust under a range of future climate projections?
- Synergies/coherence with other strategic objectives – does it help to achieve other objectives?
- Other factors which your organisation regards as important

Task 4.2: Establish the criteria against which you will evaluate your long list of adaptation options.

- Agree on the evaluation criteria that are most relevant to your situation.
- Describe these criteria to ensure those involved in the evaluation process have a shared understanding of them.
- Assess each option in turn and score their performance against each of the criteria.
- Some criteria may be more important to your organisation than others. Weight the criteria to reflect your priorities.
- Note that not all options will meet all criteria. However, the more criteria an option meets, the more suitable it is likely to be.
- Keep a record of your assessment and decision making, and make a note of any assumptions or judgements you apply.

Resources to help you

- Identifying Adaptation Options provides a good overview of climate change adaptation. This tool can be found on the Climate Ready web site in the Practical Resources section www.environment-agency.gov.uk/climateready
- Section 10.3 of *Preparing for Local Climate Change: A Guidebook for Local, Regional and State Governments* www.ukcip.org.uk/wordpress/wp -content/Wizard/snoveretalgb574.pdf (5MB) provides examples of adaptation actions that might be taken by local authorities to meet sector specific adaptation objectives.

4.3 Factors to consider when evaluating options:

How soon do you need to act?
What level of adaptation is required?
Are there 'windows of opportunity' for implementing adaptation?
What is your attitude to risk?
What happens if you over- or under-adapt?
How confident are you in this assessment?

How soon do you need to act?
If you are already experiencing problems with climate-related impacts, you may wish to act straight away to address those risks. You'll also want to act quickly if you want to take advantage of a climate change opportunity, so that you can get a head start on your competitors.

It is crucial if you are beginning to consider a long-lived decision that you take account of climate change as early as possible in the decision-making process. It is much cheaper and easier to do so at the design stage than to introduce climate change considerations late in the planning stage, or after an asset has been built.

In other cases, you'll need to decide when to take action based on how soon you expect climate risks to cause any critical thresholds for your system to be exceeded and the lead-in time for planning and implementing adaptation measures. Remember that proactive adaptation is generally more effective and less costly than reactive adaptation so it would be wise to get a head start.

Task 4.3.1: Determine when you believe it will be necessary to take action and why. Document your answer to this question.

What level of adaptation is required?
Although we are confident in the general trends we will see in our future climate, we cannot be sure exactly how much change will occur and what the precise impacts will be. There will consequently be some uncertainty over the 'ideal' level of adaptation required in any given situation.

The choices you make about how much adaptation to carry out will depend on your attitude to risk and the costs involved. The decision to adapt should take account of the balance of risks and costs of planning for climate change that does not occur, and vice versa.

- Where the cost of planning for climate change is low, but the climate risks are high, there is an unambiguous case for adaptation.

- Where the costs of adaptation are high but the risks posed by climate change are low, your proposed adaptation response may be disproportionate to the risks faced.

- Where the costs of planning for climate change and the risks of climate change are both low, there is little risk and few downsides, regardless of the choice made.

- In contrast, where the costs of adapting to climate change are high, and the climate risks are also high, the stakes and risks are very high for the planner.

To help you appraise your adaptation options, you should compare the benefits of adaptation with the costs, discounted over time. The adaptation option chosen should be the one that yields the highest net benefit, having taken account of the risks and uncertainties surrounding climate change.

Task 4.3.2: Cost your adaptation options. Compare these costs against those of the impacts that could be avoided through adaptation to estimate the monetary benefit of an adaptation.

- Apply the simplified costing guidelines (or other methods) to help you cost your adaptation options.
- Analyse how your options would perform under the different climate change scenarios to help you determine the level of adaptation you might require.

Are there 'windows of opportunity' for implementing adaptation?

Remember to look for ways of incorporating climate response strategies into mainstream activities, and consider potential synergies and conflicts with other strategies and policies. The costs of adapting to climate change can be minimised if adaptation is built into existing systems, and factored into:

- the early steps of planning new developments
- infrastructure that is being upgraded anyway
- routine maintenance that is being conducted
- plans that come up naturally for review
- your routine work plan rather than being dealt with as an emergency situation

Task 4.3.3: Identify all activities that are planned in your organisation and consider how you could take advantage of those opportunities to synergise climate adaptation with other planning and development activities.

What is your attitude to risk?

The decision on how to adapt will be influenced by your organisation's view on how much climate risk it is prepared to tolerate. If the organisation is risk averse, you may wish to identify and implement immediate quick fixes that will reduce your vulnerability to climate risk in the short term, while further analysis takes place. Think about your organisation's overall attitude to risk, as well as individual risks facing your activity, decision or organisations in addressing this question.

Task 4.3.4: Make a statement of your organisation's risk attitude and how this has influenced your evaluation of adaptation options.

What happens if you over- or under-adapt?

Adaptation strategies should be reasonable and proportional. If you over-estimate the significance of climate risks compared with the other risks you face, you may over-adapt. This could mean that resources are wasted. If, on the other hand, you under-estimate climate risks compared with the other risks that you face, and don't include sufficient adaptation measures, you will not be adequately protected (under-adapted).

Adopting a flexible decision-making process and using adaptive management can enable you to keep your options open, and be more responsive to changing situations.

Task 4.3.5: Consider the consequences (physical, financial, reputation and so on) of over- or under-adaptation to help you establish the level of adaptation thatis required. Document this decision and the reasoning behind it.

How confident are you in this assessment?

As you have done for previous steps of the Wizard, make an explicit statement about the quality of the information on which your decision is based, as well as the uncertainties that are associated with the information you have used and the decisions you have taken. Identify any areas where further work may be required, or where more quantitative analyses could be needed as further information becomes available.

4.4 Develop an implementation plan

You should now have all the information you need to develop a detailed implementation plan which sets out what needs to be done by whom and by when to convert your adaptation strategy into practical action.

The actions you need to take and the way in which you implement them will be contingent upon your chosen adaptations and will be strongly influenced by your organisation's existing internal procedures, as well as external influences on your activities (standard, regulations, targets, indicators and so on). The guidance offered here is therefore necessarily limited to pointing out key factors that should be considered when implementing your actions.

Task 4.3.6: Develop a detailed implementation plan that:

- identifies clearly roles and responsibilities for the individuals involved
- describes how preferred adaptations should be implemented (for example through new or existing management systems)
- identifies opportunities that could be exploited to synergise climate adaptation with other planning and development activities
- indicates what resources (staff, facilities, capital) will be required to implement the adaptations and monitor their effectiveness
- notes what institutional and community support will be required to implement the adaptations
- contains an effective communication strategy
- identifies potential barriers to action and mechanisms to overcome these
- sets out mechanisms for evaluating the performance of the strategy and the actions within it
- contains a detailed timetable for action

4.5 Implement your adaptations

Again, the mechanisms through which you implement your adaptations will be contingent on your chosen adaptations and the specifics of your organisation.

Step 4 Checklist

By the end of Step 4 you should have:

- decided that you have enough information to act
- identified possible adaptation measures, costed these where necessary, and selected those that are most appropriate to manage your priority climate risks
- determined what level of adaptation is required
- considered the consequences of over- or under-adapting, based on your attitude to risk
- considered how to minimise the cost of adapting
- noted the level of confidence that you attach to your assessment
- identified those issues about which you need to know more and taken steps to address those information requirements
- consolidated all the information you have generated in working through the Wizard into a formal climate adaptation strategy
- developed an implementation plan

Step 4 Useful Resources

- Identifying Adaptation Options provides a good overview of climate change adaptation. This can be found on the Climate Ready web site in the Practical Resources section www.environment-agency.gov.uk/climateready

- For more guidance on how to identify and appraise adaptation options , see Stages 4 and 5 of the 'Decision Making Framework' listed in the resources section of this document.

- The costings methodology listed in the resources section of this document, provides a method for costing climate impacts.

- Climate Change Adaptation Database http://adaptation.cbd.int provides web-based guidance on the integration of biodiversity within adaptation planning. It contains useful information and tools on how to adapt to climate change.

- The Town and Country Planning Association guide, *Climate Change Adaptation by Design* www.ukcip.org.uk/wordpress/wp-content/PDFs/LA_pdfs/CC_by_design.pdf (5.1MB) shows how adaptation can be integrated into the planning, design and development of new and existing communities. It is a valuable resource for planners, urban designers, developers and those engaged more generally in creating sustainable communities.

- For quantitative information to help you assess future climate risks see the UK Climate Projections (UKCP09) http://ukclimateprojections.defra.gov.uk

- For information on future risks to the UK from climate change see outputs from the UK's Climate Change Risk Assessment www.defra.gov.uk/environment/climate/government/risk-assessment/

Step 5. Monitor and review

It would be unwise to think that, once an adaptation strategy has been developed and implemented, the job of adapting to climate change is done.

Adaptation is an iterative process that calls for close monitoring and regular review to ensure that your organisation is 'adapting well' in a dynamic world, where what is known about the past, present and future is rapidly changing.

You will need to continually assess whether the actions you have taken are working, or whether changes or refinements are needed to respond to changing conditions and information. Furthermore, the learning that is derived from monitoring and review should be reflected in your adaptation strategy.

5.1 Do you have an effective adaptation strategy?

The real test of an adaptation strategy is whether it enables you to cope with climate change, and you will not be able to test that for many years to come. However, asking critical questions of your adaptation measures can help you to judge whether it is likely to succeed. Some such questions are presented below:

- Is it achieving the strategic objectives that you set out in Question 1.3?
- Is it performing against your evaluation criteria as well as you thought it would?
- Is it improving your resilience to existing climate variability?
- Is it fit for purpose? Is it helping you to reduce existing vulnerabilities and exploit opportunities, and is it likely to be able to continue to do so in the future?
- Does it make sound economic sense, and do the benefits outweigh the costs?
- Does it help you to fulfil other social, environmental and economic goals? Are any synergies you hoped it would achieve being realised?
- Are the adaptation actions you identified being readily – or reasonably – implemented? If difficulties have been encountered in their implementation, how could these be overcome?
- Is it sufficiently flexible to be able to accommodate changing information and priorities?
- Has new information come to light that calls for you to re-evaluate or alter your adaptation strategy?
- Can it be readily understood and accessed by all relevant stakeholders?

Task: Critically monitor your adaptation strategy on a routine basis, asking the questions of it that are posed above.

Resources to help you

- The adaptation monitoring and evaluating toolkit, AdaptME, provides helpful guidance on how to approach this step. This can be found on the Climate ready web site in the practical resources section www.environment-agency.gov.uk/climateready

- The Defra report, *Measuring Adaptation to Climate Change – A Proposed Approach* www.ukcip.org.uk/wordpress/wp-content/Wizard/Defra-measuring-adapt.pdf (182KB) focuses on the national level but has valuable insights for UK organisations.

Task 5.1: Develop an effective monitoring and evaluation programme and include this as part of your adaptation strategy document. The programme should:

- define measures of success
- describe how results and lessons learnt will be fed back into the management process
- identify changes in risks and or opportunities
- review your assumptions
- monitor sources for new information on climate change (subscribing to Climate Ready's monthly e-news bulletin will help you to keep abreast of developments)

Consider performance relative to your expectations. Are the outcomes consistent with your plan? Is it meeting your objectives?

Consider asking:

- What aspects are working and which are not?
- Have there been any unexpected knock-ons?
- Has any new information come to light that could alter the effectiveness of your adaptation measures?

5.2 How often should you review your strategy?

At the outset of the Wizard, we emphasised the importance of framing your objectives carefully before you started. However, your objectives and priorities will shift with time, and circumstances could change, so new risks may arise or change in priority. Climate risks may also change.

Review your strategy annually or sooner if a factor that has influenced your strategy changes significantly (for example, you are hit by an extreme weather event or important new climate change information becomes available).

5.3 When should you change your strategy?

You should improve your strategy if it does not deliver the benefits you were expecting it to or if the options you chose have not performed as you expected them to.

You should also keep a constant eye out for new information on climate risks. Our knowledge of climate change is improving all the time and our understanding of potential impacts of climate change is continually developing. Keep on top of the key information for your activity to ensure you have a strategy that is valid, relevant and responsive to changing conditions.

Ideally, build the review of your adaptation strategy into part of a regular, organisation-wide review of all strategies to ensure they are performing as required.

Resources

- Case studies
- Climate change projections
- Decision-making framework
- Costing guidelines
- Identifying Adaption Options
- BACLIAT (Business Impacts Assessment Tool)
- Types of adaptation strategies
- Checklist of risk categories
- Local Climate Impacts Profile (LCLIP)
- Preparing for Change: Climate-proof your tourism business

Case studies

The following case studies were developed by UKCIP by working through the Wizard on a one-to-one basis with a small number of businesses:

- Gentoo Housing Association
  www.ukcip.org.uk/wizard/wizard-case-studies/gentoo/
- Kingfisher plc
  www.ukcip.org.uk/wizard/wizard-case-studies/kingfisher-plc/
- Midcounties Cooperative
  www.ukcip.org.uk/wizard/wizard-case-studies/midcounties/
- The Port of Felixstowe
  www.ukcip.org.uk/wizard/wizard-case-studies/felixstowe/
- Redhill School
  www.ukcip.org.uk/wizard/wizard-case-studies/redhill-school/
- Severn Trent Water
  www.ukcip.org.uk/wizard/wizard-case-studies/severn-trent-water/

Climate change projections

The UK Climate Projections (UKPC09) http://ukclimateprojections.defra.gov.uk/ are the latest future climate change information for the UK. They provide information about expected climate changes in the UK over the 21st century at a 25 km resolution, for three different greenhouse gas emissions scenarios. As well as changes in average seasonal climate, there is also information on changes in climatic extremes. For the first time ever, UK climate change information is probabilistic in nature. The following UKCP09 resources are available:

- **What is UKCP09?**
  http://ukclimateprojections.defra.gov.uk/21678 describes attributes of UKCP09 and some of the potential benefits it offers, as well as some of the guiding principles that apply to its development and use.

- **Maps and key findings**
  http://ukclimateprojections.defra.gov.uk/21708 provide an overview of the main changes described by UKCP09 for the UK as a whole and for each of the 16 administrative regions in the UK. Projected temperature and precipitation changes for the 2020s, 2050s and 2080s are available under the High, Medium and Low emission scenarios and at 10, 50 and 90% probability levels. The maps and graphs pages contain a series of maps and graphs that are useful for visualising projected changes.

- **Reports and guidance**
  http://ukclimateprojections.defra.gov.uk/22530 provides links to the suite of reports published to cover the various components of UKCP09.

- **The briefing report**
  http://ukclimateprojections.defra.gov.uk/22536 contains a summary of the 2009 UK Climate Projections (UKCP09), consolidating the scientific reports for the general reader as well as describing the methodology and some key projections of future climate change for the UK over the 21st century.

- **The climate change projections report**
  http://ukclimateprojections.defra.gov.uk/22537 is designed for those who wish to find out more about the purpose and design of the UKCP09 methodology for producing the probabilistic projections of climate change, and is drafted to suit a range of levels of expertise.

- **The Weather Generator report**
  http://ukclimateprojections.defra.gov.uk/22540 introduces the UKCP09 Weather Generator and outlines the need for it, its principles and how it can be used.

- **The marine and coastal projections report**
  http://ukclimateprojections.defra.gov.uk/22530 provides an overview of marine change around the UK, showing key findings and detailing the science used.

- Customisable output and underlying model data are available from the UKCP09 user interface http://ukclimateprojections-ui.defra.gov.uk/ui/admin/login.php. Please note you will be asked to register to access this site.

Decision-making framework

The UKCIP report, *Climate Adaptation: Risk, Uncertainty and Decision-making,* provides a step-by-step decision-making framework www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf (1.2MB) to help planners, businesses and government assess the risk posed by climate change and work out how best to respond. The Adaptation Wizard is based on the risk framework presented in the report.

- For specific guidance on framing your problem and setting criteria, see Stages 1 and 2 of the risk framework www.ukcip.org.uk/wordpress/wp-content/Wizard/risk_stages_1_2.pdf

- For guidance on decision-making with climate change uncertainty see Section 2.3.1 of the report www.ukcip.org.uk/wordpress/wp-content/Wizard/risk_pp54to56.pdf

- For guidance on risk attitude and thresholds see pages 70–73 of the report www.ukcip.org.uk/wordpress/wp-content/Wizard/risk_pp70to73.pdf

Costing guidelines

These UKCIP-developed guidelines provide a methodology for costing climate change impacts and adaptation, so that the costs of impacts can be compared to the costs of adaptation measures, and the most appropriate measures can be selected.

Details of the guidelines are given in the following reports:

- *Costing the Impacts of Climate Change in the UK: Overview of Guidelines* www.ukcip.org.uk/wordpress/wp-content/PDFs/Costings_overview.pdf (2.8MB)
- *Costing the Impacts of Climate Change in the UK: Implementation Report* www.ukcip.org.uk/wordpress/wp-content/PDFs/Costings_Implementation.pdf (4.63MB)

Some case studies on costs of climate change impacts are given in the following regional studies:

- London scoping study www.ukcip.org.uk/wordpress/wp-content/PDFs/London_tech.pdf (3.4MB)
- West Midlands scoping study www.ukcip.org.uk/wordpress/wp-content/PDFs/WM_tech.pdf (7MB)

Identifying Adaption Options

This tool provides an overview of adaptation and is a useful starting point for work on adaptation. It contains examples of building adaptive capacity (BAC) and delivering adaptation actions (DAA), and explains what different categories of adaptation measures are in practice.

This tool can be found on the Climate Ready web site in the Practical Resources section
www.environment-agency.gov.uk/climateready

BACLIAT (Business Areas Climate Impacts Assessment Tool)

BACLIAT is a good starting point for exploring the implications of climate change for your particular business or sector. It consists of a simple checklist for assessing the potential impacts of climate change under generic business areas.

This can be found on the Climate Ready web site in the Practical Resources section
www.environment-agency.gov.uk/climateready

Types of adaptation strategies

The typology can be used to stimulate thinking on the range of possible adaptation strategies.

Checklist of risk categories

The checklist is a long list of risks, which can help structure thinking on non-climate risks.

Local Climate Impacts Profile (LCLIP)

An LCLIP is a simple resource that organisations can prepare to help them better understand their exposure to weather and climate. Guidance on how to prepare an LCLIP is available from Practical resources on
www.environment-agency.gov.uk/climateready

This tool can be found on the Climate Ready web site in the Practical Resources section
www.environment-agency.gov.uk/climateready

Preparing for Change: Climate-proof your tourism business

If you run a tourism business, this toolkit www.climateprepared.com/index.php will be of interest. Developed by Climate South East, in partnership with the South West Climate Change Impacts Partnership, Tourism South East and South West Tourism, the toolkit helps businesses to assess how they may be affected by the impacts of flooding, heatwaves and drought. It suggests practical actions to reduce risk and take advantage of the opportunities, and provides guidance to further information and support. Users can complete a checklist and receive a personalised action plan that allows them to monitor progress in improving resilience.

Adaptation Wizard Notepad

This document contains key questions from the Wizard that require an answer or response.

The following tables and spreadsheets are the Adaptation Wizard Notepad. You may find it easier to re-create them for yourself, so you can type directly into them.

Enter your answers to each question in the tables. The information you capture can be used as a technical appendix to support your adaptation strategy document. Insert any figures and diagrams that may support or strengthen your document.

STEP 1: Getting started

Task 1.1: Put the building blocks in place	
a) Assemble your team: who needs to be involved and why? b) Have you secured support for the process?	

STEP 1: continued

Task 1.2: What is your particular motivation for considering adapting to climate change?	

Task 1.3: What do you want to achieve by using the Wizard?	
a) What is the problem that needs to be addressed? b) What do you want to achieve? c) What is the chosen scope and scale of the assessment, and why? d) What are the criteria against which you will judge a successful outcome? e) What is the lifetime of your decision likely to be? f) Do you have the right team of people involved?	

Task 1.4: What difficulties might you face and how could they be overcome?	
a) Identify potential barriers and consider how they might be overcome. If helpful, develop a force field diagram like the one presented in Task 1.4. The omit the diagram from the notepad. b) Consider how your organisation works, and how changes are usually made in your organisation.	

STEP 2: Is my organisation vulnerable to the current climate?

Task 2.1: How have previous weather events affected your organisation?	
Establish how your organisation has been affected by recent weather events. Analyse the events, their consequences and your organisation's response, capturing information in Table 2.1.	

Task 2.2: How well did your organisation cope with past weather events?	
Include your analysis in Table 2.1.	

Task 2.3: Is it possible to identify any critical thresholds for your situation?	
If so, identify these and add to Table 2.1.	

Task 2.4: How confident are you in this assessment?	
Fill in the answer in Table 2.1 and note where more information is required.	

Table 2.1: How have previous weather events affected your organisation?

Complete this table to develop a profile of your organisation's vulnerability to recent weather and climate.							
Completed by:							
Date:							
Climate variable (a)	**Specific event (b)**	**Impact (c)**		**Identify critical thresholds (e)**	**Actions taken to address impact (f)**	**Effectiveness of those actions (g)**	**Source and credibility of information (h)**
High summer temperatures	30°C for two days	Offices overheated	Staff uncomfortable	Internal office temperatures exceed 28°C	Relax dress code, flexible working hours, use fans, supply staff with cold drinking water		Past experience. Reliable
Mild winter temperatures							
Dry summers							
Wet winters							
Rising sea levels							
and so on							

Note: For definitions of table headings see UKCIP Glossary www.ukcip.org.uk/glossary

STEP 3: How will your organisation be affected by future climate change?

Task 3.1: How is the UK's climate expected to change?	
Refer to the UKCP09 climate change projections.	

Task 3.2: What are the key climate impacts on your areas of responsibility?	
Identify specific impacts, or climate risks, to your organisation by completing Table 3.2.	

Task 3.3: Are there indirect climate impacts that need to be considered?	
Complete in Table 3.2.	

STEP 3: continued

Task 3.4: What risks do these climate impacts present?	
Complete in Table 3.4.	

Task 3.5: Will climate risks be more or less important than other non-climate risks my organisation faces?	
List or rank the non-climate risks affecting your activity.	

Task 3.6: What are the priority risks that require an adaptation response?	

Task 3.7: Do you need to find out more?	

Table 3.2: What are the key climate impacts on your areas of responsibility?

This table can be used as a guide to scope the impacts of future climate changes on an organisation. You may wish to consider climate variables individually, or in combination with others (for example, milder, wetter winters and hotter, drier summers). You could also structure your assessment around the six business areas listed in the BACLIAT tool (people, premises, processes, logistics, finance and markets), considering the impacts of future climate changes on each business area. Alternatively you may wish to identify specific receptors that are more appropriate for your organisation (column (e)). Please amend this table as necessary to reflect your own organisation's activities and exposures.

(a) Climate variable	(b) Specific event (if applicable)	(c) Timescale, emission and probability level being considered	(d) Projected change in event in future	(e) Receptor (i.e. the 'thing' being affected)	(f) Threats (negative impacts)	(g) Opportunities (positive impacts)	(i) Consequences
For example:							
Summer temperatures							
Summer precipitation							
Mean winter temperatures							
Mean winter precipitation							
More extreme weather (list each type)							

Note: For definitions of table headings see UKCIP Glossary www.ukcip.org.uk/glossary

Table 3.4: Assessing the risk of climate threats in present and future

Threat No.	Climate variable	(f) Threat	(g) Likelihood of threat occurring	(h) Magnitude of consequence should the threat occur	(i) Risk (h) x (i)	(j) Likelihood	(k) Magnitude	(l) Risk (j) x (k)	Assumptions in risk rating/notes
		Present				Future time slice (1)			
1									
2									
3									
4									
and so on									

STEP 4: Identify, assess and implement your adaptation options.

Task 4.1: Identify a range of adaptation options	

Task 4.2: Evaluate your adaptation options	

Task 4.3: Consider the following when evaluating options	

Task 4.4: Develop an implementation plan	

Task 4.5: Implement your adaptations	

STEP 5: Monitor and review

Task 5.1: Do you have an effective adaptation strategy?	

Task 5.2: How often should your strategy be reviewed?	

Task 5.3: When should you change your strategy?	

Bibliography

Brown, A., Gawith, M., Lonsdale, K. and Pringle, P., 2011. *Managing Adaptation: Linking Theory and Practice*. Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Managing_adaptation.pdf (5.8MB)

Climate Impacts Group, 2007. *Preparing for Local Climate Change: A Guidebook for Local, Regional and State Governments*. Seattle, WA: Center for Science in the Earth System (The Climate Impacts Group), Joint Institute for the Study of the Atmosphere and Ocean, University of Washington and King County, Washington. Available from: www.ukcip.org.uk/wordpress/wp-content/Wizard/snoveretalgb574.pdf (5MB)

Defra, 2010. *Measuring Adaptation to Climate Change – A Proposed Approach*. London: Defra. Available from: http://archive.defra.gov.uk/environment/climate/documents/100219-measuring-adapt.pdf

Entec UK Limited, 2003. *The Potential Impacts of Climate Change in the West Midlands*. Technical Report. Birmingham: Sustainability West Midlands. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/WM_tech.pdf (7MB)

Government Office of the South West, 2004. *Managing Change: How to manage change in an organisation*. Government Office of the South West. Available from: www.oursouthwest.com/SusBus/mggchange.html.

Hacker, J.N., Belcher, S.E. and Connell, R.K., 2005. *Beating the Heat: Keeping UK buildings cool in a warming climate*. UKCIP Briefing Report. Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/Beating_heat.pdf (7.4MB)

Harvey, A., 2010. *A brighter outlook*. Sustainable Business magazine, April 2010. Available from: www.ukcip.org.uk/wordpress/wp-content/Wizard/Business_case.pdf (500KB)

HM Treasury, *The Orange Book: Management of Risk – Principles and Concepts*. London: HM Treasury. Available from: www.hm-treasury.gov.uk/d/orange_book.pdf 2004.

Jenkins, G.J., Murphy, J.M., Sexton, D.M.H., Lowe, J.A., Jones, P. and Kilsby, C.G., 2009. *UK Climate Projections: Briefing report*. Exeter: Met Office Hadley Centre. http://ukclimateprojections.defra.gov.uk/22549

Bibliography

LCCP, 2002. *A Climate Change Impacts in London Evaluation Study.* Final Report. London: London Climate Change Partnership. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/London_tech.pdf (3.4MB)

Lonsdale, K.G., Gawith. M.J., Johnstone, K., Street, R.B., West, C.C. and Brown, A.D., 2010. *Attributes of Well-adapting Organisations.* Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Well_adapting_organisations.pdf (1.1MB)

Metcalf, G., Jenkinson, K. and Johnstone, K. (eds.), 2010. *A Changing Climate for Business,* 3rd edition. Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP_Business.pdf (2.5MB)

Metroeconomica Ltd, 2004. *Costing the Impacts of Climate Change in the UK: Overview of Guidelines.* UKCIP Technical Report. Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/Costings_overview.pdf (810KB)

Metroeconomica Ltd, 2004. *Costing the Impacts of Climate Change in the UK: Implementation Report.* UKCIP Technical Report. Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/Costings_Implementation.pdf (4.7MB)

Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds.), 2007. *Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* 2007. Cambridge and New York: Cambridge University Press. Available from: http://ipcc.ch/publications_and_data/ar4/wg2/en/contents.html.

Shaw, R., Colley, M. and Connell, R., 2007. *Climate Change Adaptation by Design: A guide for sustainable communities.* London: Town and Country Planning Association. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/LA_pdfs/CC_by_design.pdf (5MB)

SNIFFER, 2006. *An Online Handbook of Climate Trends across Scotland.* Exeter: Met Office. Available from: www.climatetrendshandbook.adaptationscotland.org.uk/index.html.

Stern, N., 2006. *Stern Review of the Economics of Climate Change.* London: HM Treasury. Available from: http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/sternreview_index.htm.

West, C. and Gawith. M., 2005. *Measuring Progress: Preparing for climate change through the UK Climate Impacts Programme.* Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/MeasuringProgress.pdf (1.6MB)

Willows, R. and Connell, R. (eds.), 2003. *Climate Adaptation: Risk, Uncertainty and Decision-making*. UKCIP Technical Report. Oxford: UKCIP. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf (1.2MB)

Three Regions Climate Change Group, 2005. *Adapting to Climate Change: A checklist for development*. London: Greater London Authority. Available from: www.ukcip.org.uk/wordpress/wp-content/PDFs/Checklist_for_development.pdf (512KB)

Useful links

Climate Change Adaptation Database http://adaptation.cbd.int/

Climate UK www.climateuk.net

Designing effective risk matrices (ioMosaic Corporation)
www.iomosaic.com/solutions/srms.aspx

ESPACE (European Spatial Planning: Adapting to Climate Events)
www.espace-project.org

IPCC Data Distribution Centre data visualisation tools
www.ipcc-data.org/ddc_visualisation.html

Met Office Hadley Centre
www.metoffice.gov.uk/climatechange/science/monitoring/ukcp09/

UK Climate Change Risk Assessment
www.defra.gov.uk/environment/climate/government/risk-assessment/

UK Climate Projections (UKCP09) http://ukclimateprojections.defra.gov.uk

UK Resilience www.cabinetoffice.gov.uk/ukresilience

UKCIP case studies www.ukcip.org.uk/case-studies/

UKCIP costings methodology
www.ukcip.org.uk/wordpress/wp-content/PDFs/Costings_overview.pdf
(810KB)

UKCIP risk framework www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf
(1.2MB)

UKCP09 Threshold Detector http://ukclimateprojections.defra.gov.uk/22587

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