



Llywodraeth Cymru  
Welsh Government

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# Preparing for a changing climate

## Part 2: Investigating

Statutory Guidance under the Climate Change Act 2008

## Acknowledgements

In preparing this Guidance, we have been influenced by existing non-statutory guidance, primarily [Adapting to climate change: Workbook for public sector organisations](#) (Adaptation Scotland, 2011). That document in turn recognises its debt to other guidance, including that by the [UK Climate Impacts Partnership \(UKCIP\)](#) and [International Council for Local Environmental Initiatives \(ICLEI\) Canada](#).

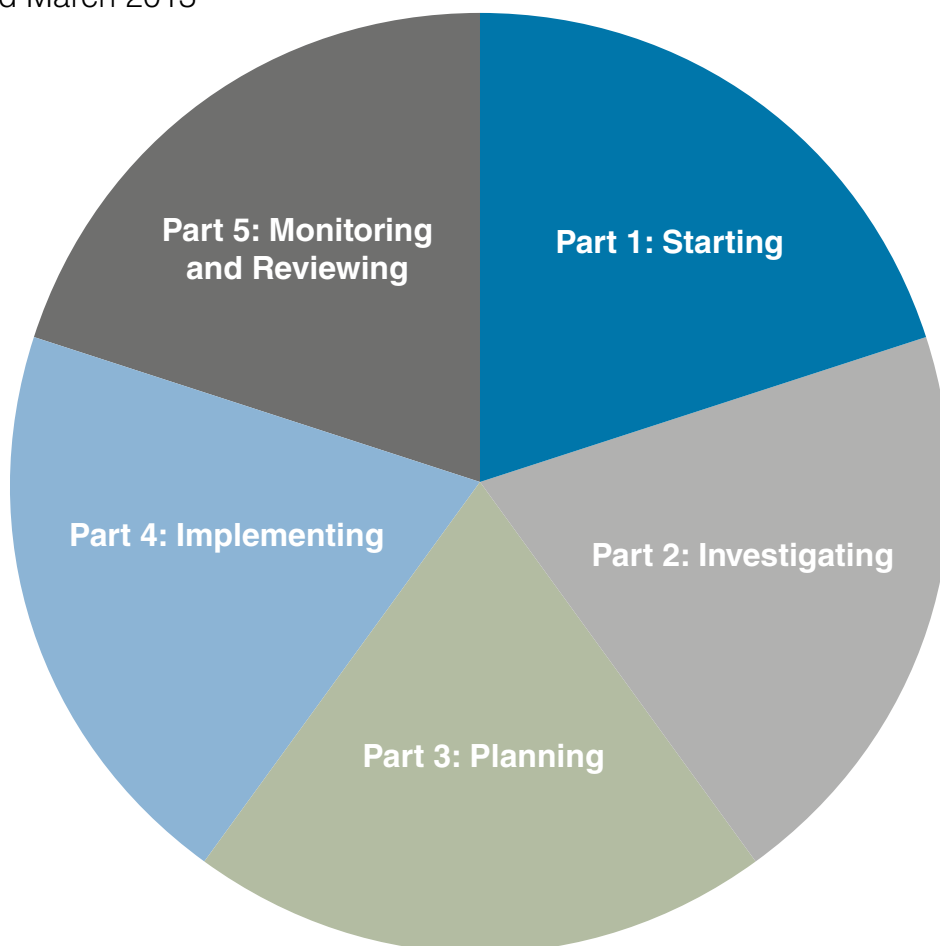
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## Part 2: Investigating

Part 2 involves refining your climate change impacts identified in Part 1, and identifying levels of sensitivity and adaptive capacity. It also includes a climate change risk assessment that explores the likelihood and consequence of each impact and provides your organisation with a list of prioritised impacts to develop actions for in Part 3.

This part includes:

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## Chapter 4: A Closer Look at What Climate Change Means for your Organisation

<b>Purpose</b>	To develop information about the impacts of climate change for your organisation.
<b>Contents</b>	<ul style="list-style-type: none"> <li>Refining your impacts identified in Chapter 2.</li> </ul>

As a result of your work in Chapter 2, you are likely to have a long list of impacts that either have already affected your organisation or have been identified as potential impacts in the future. However, you are unlikely to have the resources to consider each of these impacts in detail. This chapter therefore suggests a process for refining your list in order to identify those impacts that you may wish to consider in vulnerability and risk assessments in Chapters 5 and 6.

### Key messages from the UK Climate Projections 09

The key messages for Wales are:

- More intense rainfall events
- More flooding of low-lying coastal areas
- Hotter, drier summers;
- More extremely warm days;
- Milder, wetter winters;
- Less snowfall and frost;
- Lower groundwater levels.

It is important to note that the projections are not predictions or forecasts as they do not suggest which emissions scenario and future climate is most likely. They are also findings for Wales as a whole and there may be considerable variation at a local scale across the country.

### Refining your impacts

The first step in refining your impacts is for you and your core partners to consider and agree the scale of your work. Is the priority to take a high-level look at impacts affecting the organisation as a whole? Or should initial efforts focus on assessing detailed impacts for specific departments/ service areas/types of infrastructure/assets/communities?

There is no right or wrong answer to this question; both approaches are viable and in some cases organisations choose to assess top level impacts alongside work looking at more detailed impacts for specific areas of concern or interest.

The 'Refining' sheet of the [Guidance Spreadsheet](#) in the workbook follows on from the data you entered into the 'Exploring' sheet. Working with partners and stakeholders, use this sheet to record extra information for the impacts that meet the scale of work you have chosen:

- Specify the **context** of the individual impact; whether it is being considered in the context of the whole organisation/for a specific city, town, geographical area and/or for a specific department/service/business area.
- If appropriate, specify the **asset(s) or infrastructure** to which the impact relates (e.g. a particular building/estate/rail link).
- Specify the **timescale, emission scenario<sup>1</sup> and probability level** being considered. The [UK Climate Projections website](#) provides information on these criteria. What do you and your core partners/stakeholders mean by short, medium and long-term? What will be the cumulative impacts of events/trends over time? The Welsh Government case study project '[Investigating and Planning for Climate Risk. Applying the UK Climate Projections 2009 in Wales](#)' may help with this.
- What could be the **consequences** of this impact in the future if action is not taken?
- Note departments/communities that are likely to be **directly affected** by the impact.
- Note departments/communities that are likely to be **indirectly affected** by the impact.
- Specify the **department or stakeholder group** involved with identifying the impact.

An example is provided in the 'Refining' sheet of the [Guidance Spreadsheet](#).

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<sup>1</sup> The three emissions scenarios return broadly similar results if you look at the data for the 2020s; beyond that date the emissions scenario that you choose significantly affects the result.

## Chapter 5: Assessing your Organisation's Current Vulnerability to Climate Change

<b>Purpose</b>	A vulnerability assessment will help you to identify, quantify, and prioritise your organisation's existing vulnerabilities to climate change.
<b>Contents</b>	<ul style="list-style-type: none"> <li>• Sensitivity and adaptive capacity.</li> <li>• Assessing your organisation's current vulnerability to climate change: assessing sensitivity and adaptive capacity, and assigning vulnerability ratings.</li> </ul>

Once you have a set of impacts that you consider to be particularly important and relevant to your organisation, a vulnerability assessment will allow you to identify those impacts that the organisation/community/asset/infrastructure is least able to cope with. Information generated by your vulnerability assessment can also help to identify actions.

In the context of preparing for a changing climate, vulnerability is defined as:

*'The extent to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It depends not only on a system's sensitivity but also on its adaptive capacity'. [UKCIP 2003]*

Involving relevant stakeholders is likely to make any vulnerability assessment more complete.

For each impact, you can assess your current vulnerability by considering and assigning scores relating to:

- **Sensitivity:** a system's response to change.
- **Adaptive capacity:** ability of a system or population to identify risks or opportunities, and take appropriate action.

You may also want to think about how your vulnerability would change under different futures, in terms of climate (using UKCP09 climate scenarios), possible organisational changes, and wider socio-economic changes.

## Assessing current vulnerability

Assessing vulnerability involves four steps:

1. Listing impacts and affected departments, services and communities.
2. Assessing sensitivity.
3. Assessing adaptive capacity.
4. Assigning a vulnerability rating.

### Step 1: Listing impacts and affected departments, services and communities

You may wish to use the 'Vulnerability' sheet of the Guidance Spreadsheet in the workbook to record your vulnerability assessment. If you completed the 'Exploring' and 'Refining' sheets, then the 'Vulnerability' sheet should contain the information that you entered regarding impacts and the departments or communities affected.

### Step 2: Assessing sensitivity

#### **Sensitivity is a system's response to change**

Look at each impact and assess, as far as possible, if changing climate conditions will significantly affect how the affected departments/services/communities operate. For example, if your corporate buildings are already in disrepair, warmer temperatures and/or flooding are likely to exacerbate the problem.

Work with stakeholders to:

- Consider how the affected departments/services/communities would be affected if the impact was to become more frequent and more severe;
- Assess whether the department/service/community is subject to any existing stress that will affect their ability to cope, and whether the climate change impact will exacerbate that stress;
- Assign a value that represents the sensitivity of the department/service/community to the climate change impact. You may wish to use the sensitivity ratings below:

Sensitivity rating	Rationale
1	No change - will not be adversely affected.
2	Unlikely to be adversely affected.
3	Yes - will be affected.
4	Yes - will be severely affected.
5	Yes - will become unmanageable.

An example is provided in the 'Vulnerability' sheet of the Guidance Spreadsheet.

### Step 3: Assessing adaptive capacity

**Adaptive capacity is the ability of a system or population to identify risks or opportunities, and take appropriate action.**

Assessing the adaptive capacity of the departments/services/communities affected by each impact will enable you to understand their ability to accommodate changes in climate, as well as the factors that need to be addressed to build adaptive capacity.

When assessing adaptive capacity, work with stakeholders to consider the following questions:

- Are the departments/services/communities affected by each impact already able to accommodate existing weather patterns and changes in climate?
- Are there barriers to the ability of the department/service/community to accommodate changes in climate? For example, the number of competing uses of a service area, the number of organisations involved in managing a service area, or the service area's biological, geographic or physical barriers might limit its flexibility.
- Are the departments/services/communities already stressed in ways that will limit their ability to accommodate changes in climate?

To assess adaptive capacity:

- Consider the projected impacts on each department/service/community.
- Assess how those impacts will affect the department/service/community. Issues you may wish to consider include:
  - **Economic resources:** Wealthier departments/communities/organisations/regions are more likely to be able to bear the costs of action than poorer ones.



- **Information and skills:** You may not have personnel who are expert in understanding and planning for the impacts of climate change; however you may have existing specialists who have a wealth of knowledge in their subject area/community. Consider how their specialist roles can be utilised and if they have access to external support bodies, for example planners having access to the TCPA.
- **Social capital:** Connections between and within social and professional networks improve the capacity of individuals and groups to prepare for and withstand impacts. Is the community tightly-knit or fragmented? Does the department work in a joined-up way?
- **Equity:** Some believe that adaptive capacity is greater where there are government institutions and arrangements in place that allow equitable access to resources.
- Use adaptive capacity ratings to assign a score for each impact and affected department/service/community. You may wish to use the ratings below:

Adaptive capacity rating	Rationale
1	Able to adapt with no problems.
2	Able to adapt but will face minor challenges.
3	Should be able to adapt but will face challenges.
4	May be unable to adapt without increased support and resources.
5	Unable to adapt without substantially increased support and resources.

An example is provided in the 'Vulnerability' sheet of the Guidance Spreadsheet.

#### Step 4: Assigning a vulnerability rating

If you have used the ratings set out above, then the final column of the 'Vulnerability' sheet of the Guidance Spreadsheet will calculate a vulnerability rating for each of your impacts based on the grid below.

The vulnerability rating will be determined by the scores you have assigned for 'sensitivity' and 'adaptive capacity', and will be based on the grid below. For example, if you score sensitivity as a 2 and adaptive capacity as a 3, the vulnerability rating would be 3.

		Sensitivity				
		1	2	3	4	5
Adaptive Capacity	1	1	1	2	2	2
	2	1	2	3	3	3
	3	2	3	3	4	4
	4	2	3	4	4	5
	5	2	3	4	5	5

The vulnerability ratings in the grid above go from 1-5, where 1 is considered to be the least vulnerable (they are able to adapt and are not sensitive) and 5 is considered to be the most vulnerable (where they are unable to adapt and are extremely sensitive).

## Chapter 6: Undertaking a Climate Change Risk Assessment

<b>Purpose</b>	To assess and prioritise climate change risks, in order to identify where action should be focussed.
<b>Contents</b>	<ul style="list-style-type: none"> <li>• Introduction to risk and risk assessment.</li> <li>• Dealing with uncertainty.</li> <li>• Assessing your organisation's climate change risks.</li> </ul>

If you have conducted a vulnerability assessment (Chapter 5), those departments/services/communities that returned the highest scores are most vulnerable to the impacts of climate change. These are the areas of most pressing concern for your organisation, and therefore you may wish to explore them further and carry out a risk assessment.

A risk assessment involves assessing the likelihood and consequence of risks and helps you to prioritise them. The need to undertake a risk assessment will depend on the scale of the impacts that are being addressed and your organisation's approach to risk management.

You may wish to read the Environment Agency (EA) [Supplementary Adaptation Guidance](#), produced to complement this Guidance. It is structured according to the areas of climate change risk where the EA has particular expertise and responsibility: flooding, coastal change, and water resources. Within each of these areas the guidance provides information and advice to help you assess current and future climate change risks. It will also help you in identifying appropriate actions (Part 3: Planning).

### Risk assessment

Although the term risk is usually associated with detrimental consequences, the process of risk assessment is equally applicable to the analysis of benefits or opportunities.

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

The risk assessment is a key foundation for your planning, and presents an opportunity to involve and learn from colleagues and stakeholders. Your risk assessment will be strengthened by the knowledge of others, particularly operational staff, who may have a greater understanding of the likelihood and consequences of events. A risk assessment can be undertaken in a workshop involving people from across the organisation.

There are several approaches to risk assessment. Your organisation will probably have its own in-house risk assessment methods, which, if used, will help to embed climate change risks within the organisation's risk management procedures. **You should therefore seek to incorporate climate change risks into any existing risk management processes.**

The section below sets out a high-level approach to risk assessment for your organisation as a whole. **If you are making an important investment or planning decision or designing a major project, then you will need to undertake a more detailed risk assessment appropriate to the scale of the project.**

It is important that you assess the degree of risk that each impact presents for the present day as well as for your chosen time scales (e.g. 2020s, 2050s). This is important because some risks might diminish with time while others might increase. Make sure that you note why these changes are likely to occur and the actions that are being taken, as they should be included in your options for action.

## Dealing with uncertainty

Decisions often have to be made with imperfect information and there may be a lot of uncertainty about the impacts of a changing climate on your organisation or community. Taking a risk-based approach involves considering the degree of risk, the consequences, and the results of taking actions.

An effective way of addressing uncertainty is to adopt a flexible or adaptive management approach, which involves implementing adaptive measures in a phased manner. This involves doing what is needed and what makes sense now, and delaying action for those risks where current understanding is less certain and risks are tolerable. However, uncertainty is not an excuse for not taking appropriate action.

## Assessing your climate change risks

You can use the information obtained from the vulnerability assessment (Chapter 5) to inform decisions about the likelihood and consequence of each impact. If you have used the 'Vulnerability' sheet of the Guidance Spreadsheet, then the vulnerability ratings that you allocated should appear in the 'Risk' sheet.

1. Consider the likelihood of each impact. Assign a value, using your organisation's risk management methodology scores, or a value of 0-5, or low, medium and high. Sample Likelihood ratings are provided below.

Likelihood rating	Recurring event	Single event
5 Almost certain	Could occur several times a year	More likely than not - probability greater than 50%
4 Likely	May arise about once per year	As likely as not - 50/50 chance
3 Possible	May arise once in 10 years	Less likely than not but still appreciable - probably less than 50% but still quite high
2 Unlikely	May arise once in 10 years to 25 years	Unlikely but not negligible - probability low but noticeably greater than zero
1 Rare	Unlikely during the next 25 years	Negligible - probably very small, close to zero

2. Consider the consequence of each impact. Assign a value, using your organisation's risk management methodology scores, or a value of 0-5, or low, medium and high. Sample Consequence ratings with examples of how these criteria could relate to different sectors are provided on the following page.

The risk column of the 'Risk' sheet will calculate the risk by multiplying Likelihood by Consequence.

<b>Consequence rating</b>	<b>Public health and safety</b>	<b>Local economy and growth</b>	<b>Community and lifestyle</b>	<b>Environment and sustainability</b>	<b>Public administration</b>
Catastrophic (5)	Large numbers of serious injuries or loss of lives	Regional decline leading to a widespread business failure, loss of employment and hardship	The region would be seen as very unattractive, moribund and unable to support its community	Major widespread loss of environmentally amenity and progressive irrecoverable environmental damage	Public administration would fall into decay and cease to be effective
Major (4)	Isolated instances of serious injuries or loss of life	Regional stagnation such that businesses are unable to thrive and employment does not keep pace with population growth	Severe and widespread decline in services and quality of life within the community	Severe loss of environmental amenity and a danger of continuing environmental damage	Public administration would struggle to remain effective and would be seen to be in danger of failing completely
Moderate (3)	Small number of injuries	Significant general reduction in economic performance relative to current forecasts	General appreciable decline in services	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Public administration would be under severe pressure on several fronts
Minor (2)	Serious near misses or minor injuries	Individually significant but isolated areas of reduction in economic performance relative to current forecasts	Isolate but noticeable examples of decline in services	Minor instances of environmental damage that could be reversed	Isolated instances of public administration being under severe pressure
Negligible (1)	Appearance of a threat but no actual harm	Minor shortfall relative to current forecasts	There would be minor areas in which the region was unable to maintain its current services	No environmental damage	There would be minor instances of public administration being under more than usual stress but it could be managed

3. Other columns on the 'Risk' sheet allow you to:

- Make a note of the **thinking** behind the level of risk so that your assumptions are transparent and so that the risk assessment can be reviewed and understood by others.
- Record the **owner** of the risk; who is responsible for its management.
- Estimate the **costs** of particular impacts by drawing on what you know about the costs of past events. For example, any information that you have gathered about the impacts of past weather-related events when talking to managers, service managers, operational staff and partners will prove useful. Such people may be able to provide monetary figures for the cost of damage to buildings, repair of infrastructure, or loss of revenue from business. This information will be important in aiding your assessment of options in Part 3: Planning.
- Note where **further information** is needed to understand the risks.

You may want to extract the risk scores and organise your information so that the highest scoring risks are at the top or plot the risks onto a 'heat map' to visualise your priority climate risks.

<b>Likelihood of threat/opportunity</b>	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5
Magnitude of consequence						

The heat map above could be used to show risk scores from 0-25, where 0 is considered to be of minimal risk (the likelihood is rare and the consequence is negligible) and 25 is considered to be of maximum risk (where the likelihood is almost certain and the consequence is catastrophic).

## Case Study

### Combating Climate Change - a role for UK forests

The Forestry Commission commissioned research to understand the risks and impacts of climate change on UK forests. The report 'Combating Climate Change - a role for UK forests' is an independent assessment to examine the potential of the UK's trees and woodlands to reduce emissions and help us prepare for a changing climate.

The study is considered to be the first national assessment of its kind in the world and is already attracting interest from other countries keen to form their own climate change plans and policies.

## Case Study

### Risk assessment - Cardiff Council

The risks identified by the BACLIAT process\* (50+) were risk assessed using a corporate methodology by the Corporate Risk Group. This methodology is based around likelihood of occurrence and consequences of the risk.

This resulted in two risks being entered onto the Corporate Risk Register:

- **Climate Change** - unpreparedness to the effects of climate change due to lack of future proofing for key (social and civil) infrastructure and business development.
- **Energy Security** - inability to secure consistent energy supply due to rising energy costs and insecurity of energy supply.

In October 2010, the climate change risk has a Red (high priority) residual risk and the energy security risk has a Red/Amber (medium priority) residual risk.

The Corporate Risk Register feeds into the Council's business planning process and work is underway with service areas to identify their key actions that need to be included in this process. The Corporate Risk Register is checked and updated quarterly.

Information on these corporate risks is also being considered within the preparation of the Local Development Plan process.

\* The Business Areas Climate Assessment Tool (BACLIAT), developed by the UK Climate Impacts Programme, is a series of workshops for business to assess past weather, brainstorm the potential impacts of future climate change, and explore possible responses.