

This guide is part of Adaptation Scotland's 'Adaptation Capability Framework' public sector guidance on adapting to climate change.

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**Adaptation
Scotland**
supporting climate change resilience

 **sniffer**
knowledge brokers
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Purpose

This guide provides a step by step guide to carrying out a strategic climate change risk assessment. It provides details of the different tasks involved in developing, completing and using a strategic climate change risk assessment and signposts to corresponding tasks included in the *Adaptation Capability Framework*. The guide is part of a comprehensive set of resources provided as part of *Adaptation Scotland's Adaptation Capability Framework* and supports completion of *Task UC3B Undertake strategic climate change risk assessment*.

The guide has been informed by best practice approaches, including the *Committee on Climate Change's UK Climate Change Risk Assessment* and the draft *ISO14091 standard on climate change risk assessment*.

Introduction

A strategic climate risk assessment is used to evaluate climate risks across your organisation or for key services / asset portfolios. This strategic 'scan' helps to understand the changing likelihood and consequence of a range of potential risks for your organisation. It enables you to prioritise climate risks, allowing you to better focus limited resources.

By completing a strategic climate risk assessment you will:

- ▶ Raise awareness and build understanding of how climate change is being experienced by your organisation
- ▶ Support open and honest dialogue to create a transparent process for recording and prioritising current and future climate risks.
- ▶ Identify actions that are already underway to manage climate risks
- ▶ Develop evidence needed to inform and build support for adaptation action.

Figure 1 (p. 3) provides an overview of the stages included in the Strategic Climate Change Risk Assessment Process. Comprehensive information about the tasks and outputs required for each stage are covered in detail in section 3.



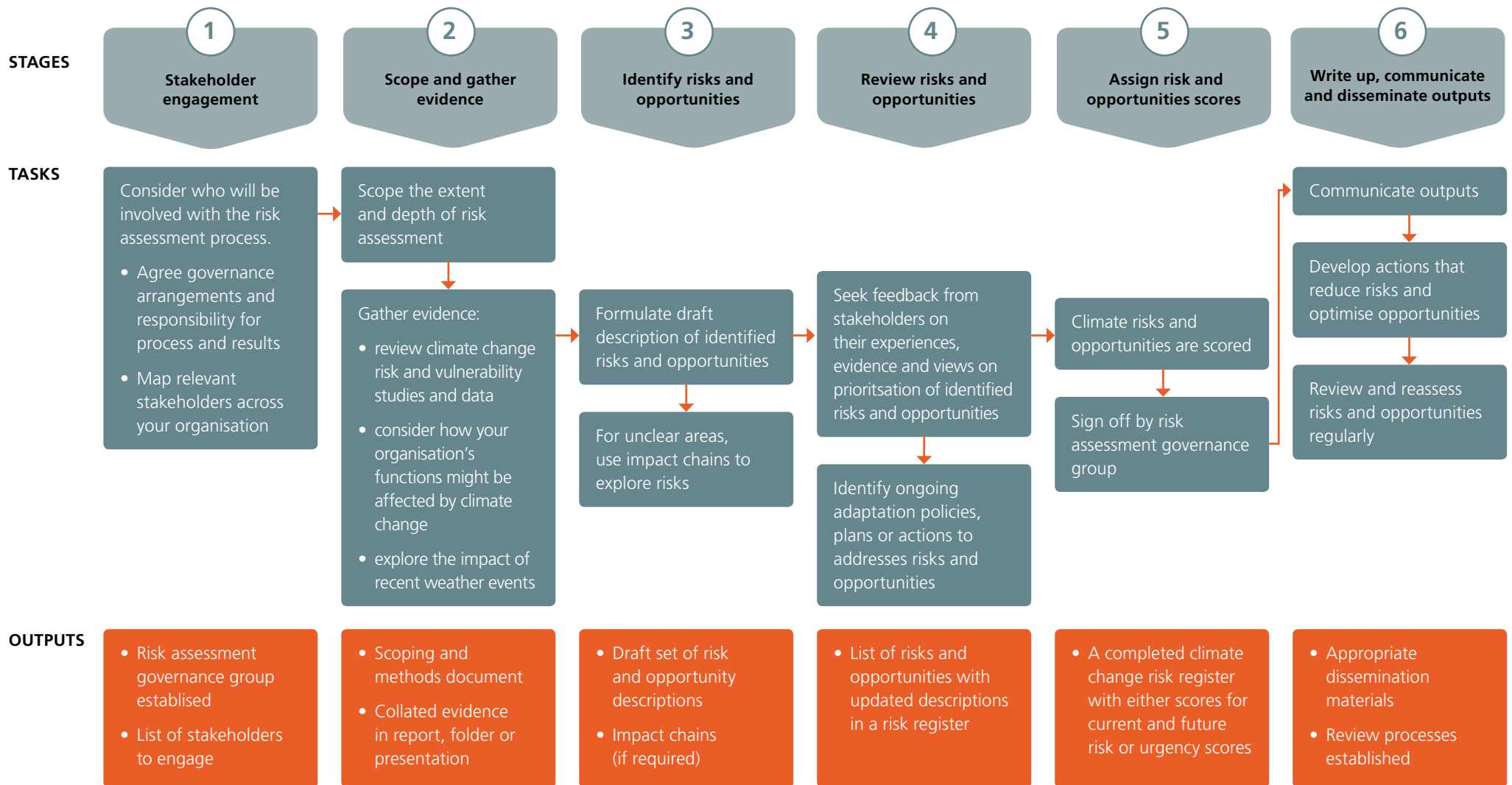
Project level risk assessments



Adaptation Scotland has developed separate guidance for **Undertaking project-level risk assessments for built environment and infrastructure projects**. A project-level risk assessment is focussed on climate risks to a specific project, policy, asset, or location. These are typically justified if they have been identified as 'at-risk' in a strategic assessment, provide a critical function of your organisation, or are major investments/assets. The narrow scope allows for an appropriately detailed analysis of climate risks.

See *Adaptation Capability Framework Task UC3C Undertake project-level risk assessment* for more information on this type of risk assessment.

Figure 1: Overview of Strategic Climate Risk Assessment Process



Completing a strategic Climate Risk Assessment

Detailed information about completing each of the stages included in the strategic climate risk assessment is provided below. Where relevant the descriptions include links to tasks and resources included within the wider [Adaptation Capability Framework](#).

Stage 1: Stakeholder engagement

Risk assessments are an opportunity to build shared understanding of climate risks and opportunities and build the case for action. Stakeholder engagement is a key part of the risk assessment process and should be managed carefully. It should include:

- ▶ Governance: Who will 'own' the risk assessment process and results? This could be an established adaptation governance group or a group set up specifically to oversee the risk assessment. Governance and responsibility for delivering the assessment and using the outputs should be clear from the outset (this is supported by [OC2C Establish governance arrangements for adaptation](#)).



- ▶ Stakeholder mapping: Contacts in different departments, organisations and sectors have experience and evidence that can inform assessment of climate risks and opportunities. Identify stakeholders who may have knowledge and expertise that can inform the risk and opportunity assessment (this is supported by [PI1C Identify key internal stakeholders for adaptation](#)).

Key outputs:

- Risk assessment governance group established
- List of stakeholders to engage



Stage 2: Scope and Gather Evidence

2.1 Scope

At the onset of your work you should **scope the extent and depth of your strategic climate change risk** assessment.

Key elements of the scope should include:

- ▶ **The purpose of the risk assessment** – Consider the aim of this work and ask the following questions:
 - Is the risk assessment being undertaken to identify climate risks to the whole organisation or only key aspects such as services or assets?
 - Does it aim to highlight opportunities such as increasing revenue or cost savings or is the intention to produce required deliverables and outputs?
 - Have any information gaps been identified that the risk assessment needs to address?

Note that if the purpose of your risk assessment is to assess risks related to a specific project, policy, asset, or location you should complete a project level risk assessment – see [Adaptation Capability Framework Task UC3C Undertake project-level risk assessment for](#)

further guidance and information on this type of risk assessment.

- ▶ **Key definitions and risk components** – Risk and vulnerability are key concepts for understanding the potential impacts of climate change on your organisation. To inform robust decision-making these need to be understood. Adaptation Scotland recommends using the IPCCs definition of climate risk, which comprises a hazard, exposure to the hazard and the vulnerability to the hazard. Appendix 1 (p. 13) provides an overview of this.
- ▶ **The time horizon of the assessment** – What time horizon will be used for the assessment? This will vary depending on the activities of the organisation. For example for Local Authorities, planning decisions on land allocations through local and strategic development plans have the potential to lock-in significant risk through to the end of the century, whilst for universities and colleges, a shorter term focus may be more appropriate.
- ▶ **Approach to uncertainty** – including emissions scenarios and socio-economic change. The time horizon of a climate change risk assessment inherently involves considering uncertainty around the amount of climate change you expect to experience, as well as broader socio-economic change (e.g. economic growth, demographic change etc.). Set out your approach to considering these. The best assessments consider the impact of a range of climate and socio-

economic uncertainties to develop an informed view of the likelihood and impact of a risk.

- ▶ **The overall boundary of the assessment** – does it include physical locations and assets, supply chains, service provision? Will there be consideration of particular groups (e.g. elderly, rural, minority groups)?
- ▶ **Scoring approach** – How will risks and opportunities be scored and prioritised? Will you use a numerical approach to current and future risk, or an urgency scoring approach (see section 5 for details on the pros and cons of each)?
- ▶ **Communication and dissemination of findings** – how will the findings be communicated internally and externally? Will it be reported to senior management, or used to engage externally?
- ▶ **Time and resource** – What staff and finance do you have available to undertake this work, and when does it need to be completed? Can the production of the risk assessment align with any key pieces of work such as investment decisions, new projects or launch of new strategies? Set out a project plan with key milestones to help guide this work.

The overall scope and method for your assessment should be written up in a coherent and comprehensive document and serve as a key milestone in your process, providing transparency and a clear reference point for those engaging with the process.

Once you have identified the focus and timeline of your strategic risk assessment and agreed this with the governance group the next step will be to collate evidence and information to understand and inform your risk assessment.

2.2 Gather Evidence

Consider how your organisation has been affected by climate impacts in the past as well as how it may be affected in the future.

This can be completed through the following activities:

- ▶ **Task UC2A Develop understanding of climate risk and vulnerability**
 - Identify existing data and resources that provide information on risk (including hazards, exposure and vulnerability) and analyse available data. Resources include:
 - UK Climate Change Risk Assessment summary for Scotland – Provides a range of sub-national data on risk assessments
 - Climate Just Tool
 - SEPA National Flood Risk Assessment
 - UK Climate Projections 2018
 - Identify past and current climate-related risks through a desk top study of published risk assessments and data including:
 - UK Climate Change Risk Assessment
 - UK Climate Change Risk Assessment Scotland summary

- Dynamic Coast: Scotland’s Coastal Change Assessment
- Historic Environment Scotland’s Climate Change Risk Assessment
- Climate Ready Clyde Risk and Opportunity Assessment
- Review a case study of how Scottish Water conducted an update to their Climate Change Risk Assessment with the support of Mott MacDonald consultancy [here](#).

▶ Task UC2B Consider how your organisation’s functions might be affected by climate change. Identify key areas or services impacted by climate change:

- Interview a small number of key service managers or contacts in your organisation to identify links between the strategic and operational priorities of different services or departments and climate impacts.

▶ Task UC2C Explore the impact of recent weather events on your organisation. Identify specific severe weather events such as storms, floods or heatwaves that have impacted your organisation. These events could have been flagged up through interviews and workshops held with colleagues (Task UC2B Consider how your organisation’s functions might be affected by climate change) or may be identified by a search of press stories. Collate evidence on how the severe weather event(s) that you identified have impacted your organisation. Potential sources of

information includes media reports, insurance logs, repair and maintenance reports, staff timesheets and emergency records.

- ▶ If relevant, consider commissioning new evidence on future risks and opportunities in key areas to fill knowledge gaps.

Use the above to create an evidence report presenting risk and vulnerability data and analysis. The amount of time and resources required to develop this will vary depending on your organisation and the scope of risk assessment that you are carrying out.

Key outputs:

- Scoping and methods document
- Spreadsheet, database, report or presentation of key evidence

Stage 3: Identify Risks and Opportunities

Review the evidence and identify key climate risks and opportunities that are within the scope of your assessment. Formulate draft descriptions of identified risks and opportunities.

Key components of a risk descriptions generally include the **impact** of a **hazard** on an organisational or place-based function – e.g.:

- ▶ Risks of heatwaves to morbidity and mortality
- ▶ Reduced financial costs and fuel poverty from reduced winter heating demand from warmer winters
- ▶ Impact of severe weather on supply chains

Summarise the characteristics and trends of the different risks and opportunities that you have identified. Read Climate Ready Clyde’s [Climate Risk and Opportunity Assessment for Glasgow City Region](#) for examples of risk descriptions.

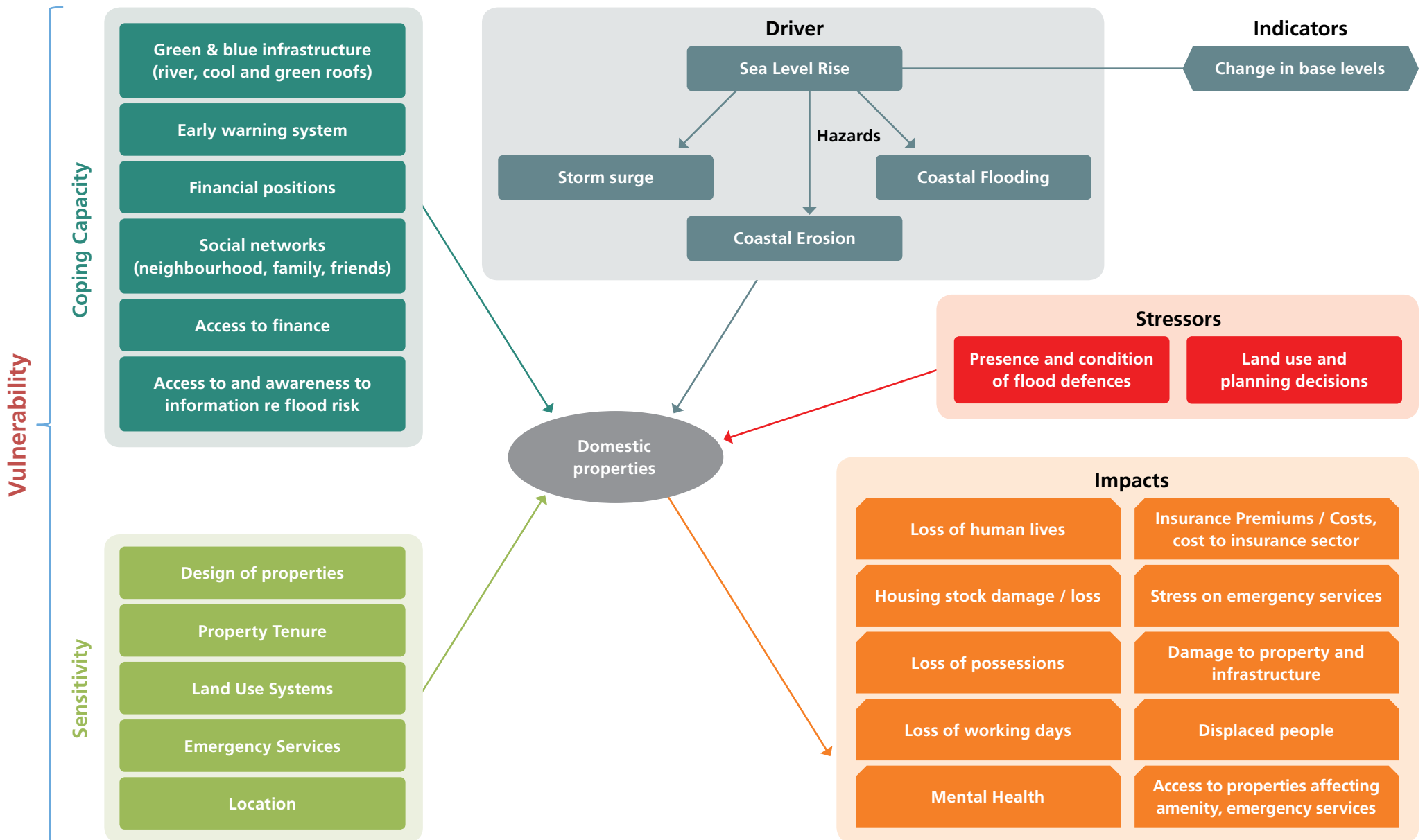
Note that for areas which are unclear, the use of impact chains, which represent the system at work can be helpful to form risk descriptions, or identify key pieces of evidence which can help quantify the scale of the risk. They are often created using a participatory method and serve as a way to explore relevant risk factors and their consequences. An example impact chain developed for Glasgow City Region is shown below in Figure 2.

They can also be created in a workshop format, using post it notes, and developed in PowerPoint.

Key outputs:

- Draft set of risk and opportunity descriptions
- Impact chains

Figure 2. Sample impact chain for sea level rise impacts on domestic properties



Stage 4: Review Risks and Opportunities

Bring the governance group and wider stakeholder network together to review the risks and opportunities that have been identified to develop a final set of risks and opportunities and assemble them into a register.

Ensure that stakeholders are clear about the scope and purpose of the risk and opportunity assessment. Be clear about what is included and excluded in the assessment and how the results will be used. Key tasks from this meeting could include:

- ▶ Present the key climate risks and opportunities that you identified in Step 3 and summarise the evidence used to identify these.
- ▶ Seek feedback on the risks and opportunities that have been identified. Do they resonate with experiences? Are stakeholders confident that the evidence supports this? Record feedback and details of any additional evidence that could be used to inform the assessment.
- ▶ Ask stakeholders to describe and where possible quantify any interactions between risks or opportunities.
- ▶ Prioritise risks and opportunities – ask stakeholders for feedback on the risks and

opportunities that they consider to be the most significant bearing in mind the likelihood and consequence of the risks or opportunities occurring.

- ▶ Identify ongoing adaptation policies, plans or actions. Record what is already being done to address the risks and opportunities that have been identified. This could include organisational policies or plans, physical measures or capacity-building actions, and won't always be identified as 'adaptation' actions. Consider how these ongoing activities reduce identified climate risks or support the organisation to realise the opportunities.

Where needed, update the evidence report (step 2) with any additional evidence identified through the engagement process. Use feedback from the review to finalise the risk and opportunity descriptions developed previously and highlight the risks and opportunities that stakeholders identified as being most significant.

Key outputs:

- List of risks and opportunities, with updated descriptions

Stage 5: Assign risk and opportunity scores

At present, there are two ways in which organisations can assign risk and opportunity scores:

- a) **Traditional risk management approach**, where current and future risk is scored based on impact and likelihood.
- b) **Urgency scoring approach**, where risks and opportunities are categorised based on the level of urgency which the organisation considers is needed, taking into account the level of risk, the shortfall in adaptation and the additional benefits of short-term action.

Both approaches are described including summaries of the advantages and disadvantages of each (section 5.1 and 5.2). Individual organisations should decide on their preferred approach taking account of the scope of the risk assessment.

5.1 Traditional risk scorings of current and future risk

The conventional approach to scoring climate change risk uses a matrix to calculate risk based on the following formula:

$$\text{Risk Score} = \text{Likelihood} \times \text{Impact}$$

Table 1: Illustrative risk scoring matrix table

			Impact				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
Likelihood	Rare	1	1	2	3	4	5
	Unlikely	2	2	4	6	8	10
	Moderate	3	3	6	9	12	15
	Likely	4	4	8	12	16	20
	Almost Certain	5	5	10	15	20	25

Many organisations have standard risk registers that can be used to complete this type of assessment. [Adaptation Scotland’s Climate Change Risk Assessment Template](#) can also be used or you may wish to create a new risk matrix based on your specific requirements.

To implement this approach the governance group, or a group of experts agreed by the governance group will score the risks and opportunities as follows:

▶ **Assess current risk**

- For each risk and opportunity assign a measure of **likelihood** of the event occurring

and the severity of the **impact**. Do this without considering controls or adaptation actions in place. The combined likelihood and impact score is the **inherent risk**.

- For each risk or opportunity consider if there are controls or adaptation actions in place that reduce the likelihood and/ or consequence of the risk occurring. Alter the likelihood and/ or consequence scores accordingly and calculate the **residual risk**.

- ▶ **Assess the future risk.** Consider how key drivers of change may alter the risk score in the future, including both climate and socioeconomic changes, in relation to future time periods agreed

in your scope. Consider how these changes may affect the likelihood and/ or consequences of each of the risks and opportunities that you have identified. Assign likelihood and consequence scores for each risk and opportunity and use these to calculate future risk.

- ▶ During the process of completing the risk register note assumptions and uncertainties behind the identified risk ratings. Figure 2, p. 10, provides an annotated summary of the steps to complete the risk register.

Advantages and disadvantages to this approach

This approach is a useful way to provide a visual and systematic approach to climate risks and opportunities, and can easily help an organisation prioritise a wide range of climate risks. It can also provide a read across to wider organisational risk registers helping an organisation understand where climate risks fit alongside other strategic risks (for example, cybersecurity and terrorism).However, there are weaknesses in that it can be difficult to agree and assign risk scores based on available evidence. This can be more challenging in situations where actions to manage the risks are the responsibility of more than one organisation, or external to the organisation.

Figure 3 Annotated image of Adaptation Scotland’s Climate Risk Register Template A

Current Climate Change Risk Register

Record the risk and opportunity descriptions formulated in Stage 3 and 4	Provide further detail on the potential consequences of the risk or opportunity	Assign a likelihood score, impact score and multiply to create the inherent risk rating	Record information on current controls or adaptation actions in place that reduce the likelihood and/or consequence			Update likelihood and impact scores based on actions in place and assess residual risk rating	Note actions which may address risks & opportunities		
Risk or Opportunity Description Hazard and impact (on the objective)	Consequence More detail on the consequences	2019 Inherent Risk			Mitigants & Controls (Existing)	2019 Residual Risk			Treatments (Proposed)
		Likelihood	Impact	Risk Rating		Likelihood	Impact	Risk Rating	
Roads and footpaths closed due to coastal flooding and erosion	Impact on public safety; fewer tourists to visiting areas; damage to path network needing repair; damage to reputation; etc.	3	3	9	Inspection regimes and good housekeeping measures in place and working effectively; Emergency surface water and river flood procedures in place and have proven effective. Shoreline Management Plan has been produced; The Severe Weather Response Plan has been developed over the past few years and ensures a co-ordinated and consistent multi-agency response across the county; Flooding advice is given on the Council website and directs people to the relevant pages on the SEPA website; Flooding and drainage issues are considered when processing planning applications;	3	2	6	The Council is working with other agencies to enhance community resilience.

Future Climate Change Risk Register

Next, consider future climate and socioeconomic changes and examine how these may affect the likelihood and/or consequences of each of the risks and opportunities. Reassess both the inherent and residual future risk considering these changes. Use a future time period that is relevant for your organisation.	Risk Modifiers			2050's Inherent Risk			M's & C's – Assume same mitigants and controls as identified for 2019	2050's Residual Risk		
	How will future change modify the risk? Consider how key drivers of change may alter in the future - both climate and socioeconomic changes.			Likelihood	Impact	Risk Rating		Likelihood	Impact	Risk Rating
	Sea level rise will increase likelihood of flooding and rates of coastal erosion			4	4	16		4	3	12

5.2. Score risks and opportunities using an urgency scoring approach

The alternative approach is to classify risks and opportunities into categories based on the types of actions needed in the short term to manage them through to the end of the time period specified in the scope.

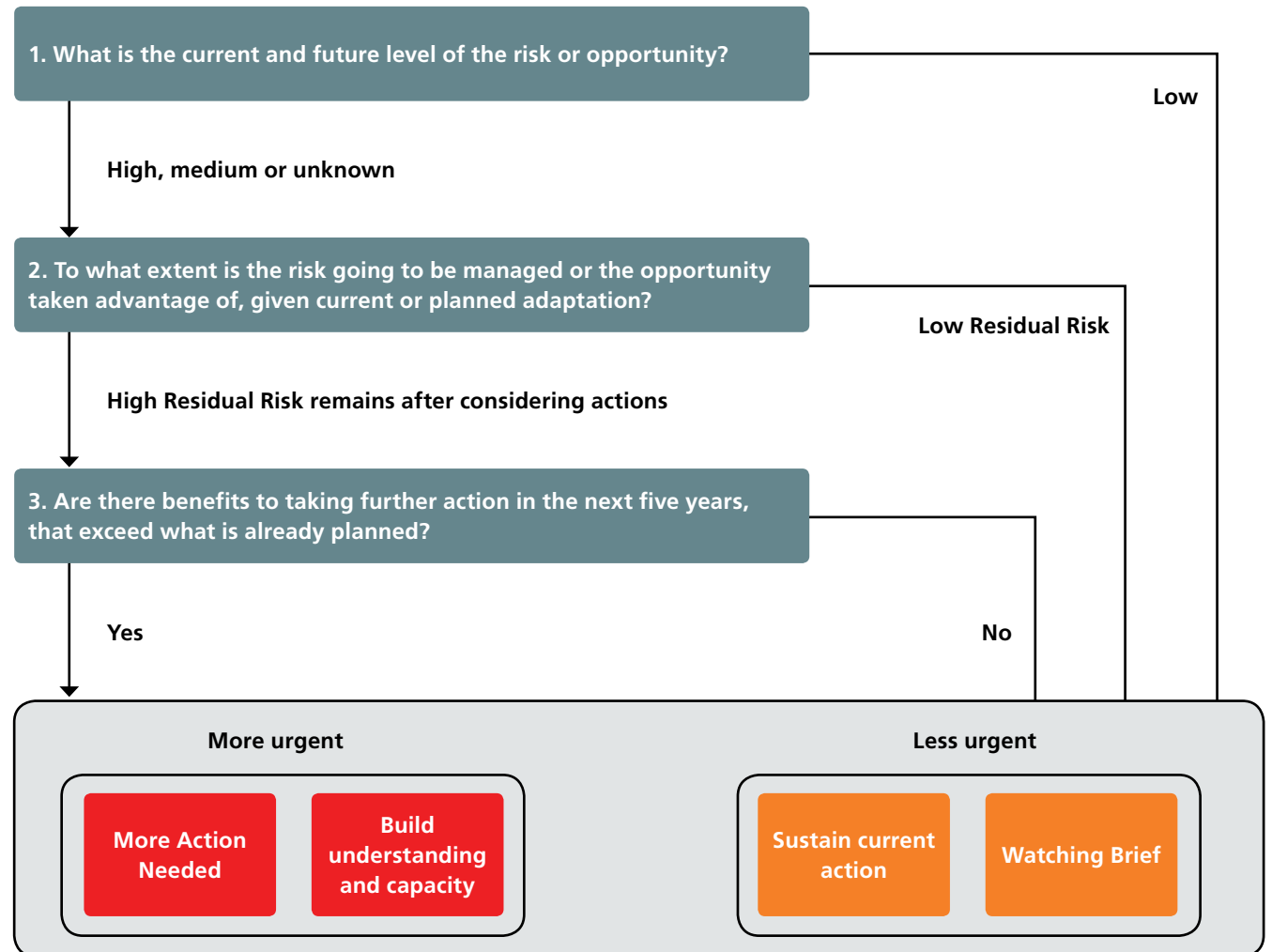
The flow diagram below was developed by the Committee on Climate Change for the second UK Climate Change Risk Assessment, and has been adapted by Adaptation Scotland to be relevant to an organisational context. It uses a decision tree to help identify the type of action needed to manage risks and opportunities, and their relative urgency

Use the decision tree to categorise each of the risks and opportunities that you have identified.

Note that detailed guidance exists for making decisions on each of these stages. For more information see:

- ▶ Second UK Climate Change Risk Assessment
- ▶ Glasgow City Region Climate Risk and Opportunity Assessment methods document

Figure 4 Flow diagram to support risk and opportunity categorisation. Adapted from the Committee on Climate Change’s Second UK Climate Change Risk Assessment Methodology

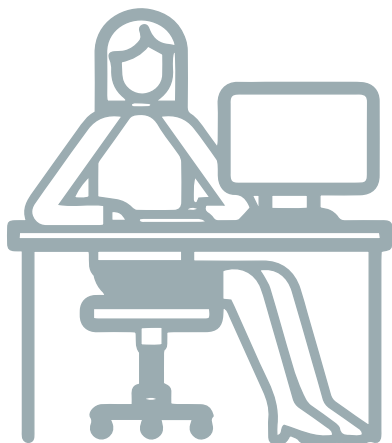


Advantages and disadvantages of this approach

The urgency scoring approach can be useful when the risks and opportunities in scope cut across multiple organisations or departments and where there is not yet consensus for the types of actions required. It can also be useful in overcoming methodological challenges in differentiating risk scores – for example where there are different risk appetites amongst teams or organisations. However, it has limitations in that it doesn't differentiate on the relative priority *within* categories. i.e. which of the 'more action needed' risks are more important.

Key outputs:

- A documented climate change risk register with either scores for current and future risk, or urgency scores



Stage 6: Writing up, communicating and disseminating outputs

Once the risk assessment is completed the final step is the communication of the outputs. This is an important part of the process and should be given considerable thought from the outset to ensure that the feedback is effective and supports organisational change and the development and implementation of adaptation actions.

Ideally the risk assessment outputs will have been defined during the scoping process in Step 2 meaning that the write up and communication is designed to meet the needs of stakeholders, based on their priority and level of understanding. Examples of ways the findings could be disseminated include:

- ▶ A short, high level summary document for key policy and decision makers
- ▶ A summary presentation of key issues
- ▶ A full technical report and risk register
- ▶ Thematic briefings for different parts of an organisation
- ▶ Full release of data and research

The results of the risk and opportunity assessment should be used to develop actions that reduce risks and optimise opportunities. This is supported by the following actions from the Adaptation Capability Framework:

- ▶ OC3A Identify opportunities to include adaptation in plans, policies and procedures
- ▶ PI3C Develop a comprehensive adaptation strategy and action plan
- ▶ PI3D Implement a programme of adaptation actions
- ▶ PI4A Adopt an ongoing adaptive management cycle for adaptation planning

Risks and opportunities should be reviewed and reassessed as part of the adaptation planning cycle to ensure that new evidence and experience is fed in to the assessments and that risk ratings remain accurate. This is supported by:

- ▶ UC3D Identify knowledge gaps, seek expertise and foster links with research and innovation
- ▶ UC4A Mainstreaming of climate change risk assessment
- ▶ UC4B Accessible climate adaptation knowledge that is integrated into internal systems and procedures
- ▶ UC4C Actively engaged in sharing, learning, research and innovation

Key outputs:

- Appropriate dissemination materials
- Review processes established for reassessing risks and opportunities as part of adaptation cycle

Appendix 1 – IPCC definitions of risk, hazard, exposure and vulnerability

The Intergovernmental Panel on Climate Change’s 5th Assessment Report defines the risk of climate-related impacts as resulting from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems.

This identifies three significant components:

- ▶ Hazards – The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources. In this report, the term hazard usually refers to climate-related physical events or trends or their physical impacts.
- ▶ Exposure – The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

- ▶ Vulnerability – The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

It also acknowledges that risks are influenced by broader climate and socioeconomic processes as well as governance and implementation of mitigation and adaptation actions.

Figure 3 Source: IPCC AR5, page 1046 – Figure 19-1

