



## Acknowledgements

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Lead authors: Rene Sommer Lindsay, Kit England and Anna Beswick

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# Foreword

Investments in built environment and infrastructure projects offer major opportunities to increase resilience and enable adaptation for current and future generations. Doing so also ensures that such projects are better supported to realise their wider economic, social and environmental benefits.

Climate Ready Clyde is delighted to partner with the Adaptation Scotland programme to develop this toolkit. We have drawn on world-leading expertise, as well as on-the-ground projects, to develop a comprehensive set of tools and resources that provide a clear and logical approach to considering climate risks in infrastructure, built environment and regeneration projects – from early screening to full assessments.

In many ways, this approach is not new – screening and risk assessment are already mandatory in all projects financed by the European Investment Bank, the European Bank for Reconstruction and Development and the European Commission. Through the Bank of England and the Prudential Regulation Authority, this is being further extended in the UK to the private sector – and is being recognised by the rating agencies.

What this guide does is help remove many of the practical barriers which are slowing the uptake of this approach – by providing knowledge, practical tools and examples to accelerate adoption of such approaches in other organisations.

Assessing for climate risk and acting on the findings delivers multiple benefits – it ensures the broader economic and social development gains are delivered, and demonstrates to investors that these issues are fully addressed – making broader private sector leverage easier to achieve. The latter is also important since rating agencies are now downgrading places and institutions where there are unmanaged risks.

I am delighted that partners operating in Glasgow City Region are at the forefront of this agenda in Scotland, having already begun to adopt climate risk assessment processes for major projects and I look forward to seeing their use accelerate and mature in the years ahead.

Nothing less is required to ensure our continuing security and prosperity in the face of increasing climate change risks.



**Professor James Curran**

Chair, Climate Ready Clyde



# Purpose

Built environment and regeneration projects should be built with future climate in mind. Over the past few years the business case and methods for doing this have matured significantly.

This guide outlines the latest financial and legal drivers and provides real world examples of projects that are successfully assessing and managing climate risks. Alongside, this guide provides a comprehensive set of tools and resources, informed by world-leading best practice that will enable Project Managers to identify climate risks and take action to address these, regardless of the size of project.

## Adapting to climate change – help and support

Adaptation Scotland supports organisations, businesses and communities to adapt to the impacts of climate change.

This guide is part of a comprehensive set of climate change adaptation resources provided as part of **Adaptation Scotland's Adaptation Capability Framework**

## Who is this guide for?

The guide is essential reading for Project Managers and will be useful for anyone involved in developing, funding, commissioning, delivering or managing built environment and regeneration projects and assets.

## What does the guide include?

The guide is divided into four parts:

### ▶ Part 1: How climate change is changing the way we build our places

Part 1 sets out the business case for adaptation in built environment and regeneration projects. It provides an overview of climate trends and projections and sets out legal and financial drivers for ensuring that built environment and regeneration projects are fit for future climate.

### ▶ Part 2: Identifying and managing climate-related project risks

Part 2 provides a simple guide to assessing and managing climate related risks. It provides an overview of risk assessment options and provides links to detailed tools and resources. It also sets out practical tools and approaches to incorporate adaptation into projects, in the wider context of Adaptation Scotland's adaptation capability framework.

### ▶ Part 3: How Glasgow City Region is Incorporating Adaptation

Part 3 showcases projects from across the Glasgow City Region and describes how adaptation is being applied in practice.

# Part 1: The business case for adaptation in our built environment and regeneration

Our climate is changing, and approaches to constructing or developing our built environment need to change along with it. In this section of the guidance we set out the need and opportunities for climate risk and adaptation to be integrated into projects.

## Scotland's changing climate

We are already seeing evidence of Scotland's climate changing. Over the last few decades there has been a warming trend, shifting rainfall patterns and rising sea levels. We have also been impacted by severe weather events, from storms to heatwaves.

Climate projections indicate that the climate trends observed over the last century will continue and intensify over the coming decades. We can expect future changes in climate to be far greater than anything we have seen in the past.

Current and projected climate change will have a wide range of impacts on built environment and regeneration projects across their design, construction, operation, and decommissioning including:

- ▶ **Building Design and Construction** – the future climate and severe weather has implications on design choices and materials, whilst severe weather and supply chain disruption from around the world could affect construction timetables.
- ▶ **Building Operation and Performance** – Climate change will impact on operation and management of our buildings and surroundings. Whether retrofitting existing or building new, it is likely that there will be issues with water management (flood risk and drought), weather resistance and overheating.
- ▶ **Infrastructure and Supply Chains – Network connectivity and interdependencies** – Energy, transport, water and ICT networks are vital to our health and wellbeing and economic prosperity, and an integral part of successful projects. The

effect of climate change on these infrastructure systems and supply chains will be varied. They are likely to be impacted by an increase in disruptive events such as flooding, landslides, drought and heatwaves. Our infrastructure is closely interlinked and failure in any area could lead to wider disruption across these networks.

## The changing financial and regulatory landscape

The financial sector, particularly investors and lenders is taking a significant interest in climate risks and adaptation responses. This is driven by international agreements on the need to reduce emissions and adapt to the impacts of climate change, and experience of the rising cost of climate impacts affecting major cities around the world. Some of the key financial and regulatory changes are outlined below:

## International

A growing number of institutional investors and insurers are demanding thorough analysis of climate change risks and vulnerabilities as a prerequisite for financing any major investment in infrastructure and urban development. The financial sector, supported by UNEP-FI has begun to explore the implications of climate change risks for the financial services sector, with UNEP-FI and Acclimatise piloting work with 16 banks to assess the financial risks from physical climate change in the agricultural sector and built environment (UNEP-FI and Acclimatise, 2018). In parallel, financing institutions and municipalities are embedding adaptation into their funding requirements, and strengthening their own ability to understand, identify and assess climate change risk in projects. The Task Force on Climate Related Financial Disclosures (TCFD, 2015) provides a broad framework for funders to establish these requirements, since it requires companies to consider the effects of physical climate risks to their sites, assets, activities and supply chains.

## EU

Adaptation has been mainstreamed as a requirement into a range of policies and plans, including Environmental Impact Assessment, European Regional Development Fund, and the Common Agricultural Policy. The recent evaluation of the EU Adaptation strategy recommended

continuing this work (European Commission, 2018) with a focus on European Structural Investment Funds, Common Fisheries Policy and the Common Agricultural Policy, as well as a continuing to promote resilient infrastructure and encouraging development of more resilient financial products and services. Separately, the European Investment Bank and European Bank for Reconstruction and Development have begun screening loans and grants for climate risks, and mainstreaming their climate change policies to also include adaptation measures and resilience thinking (EIB, 2019, EBRD and SEI, 2019.).

## UK and Scottish

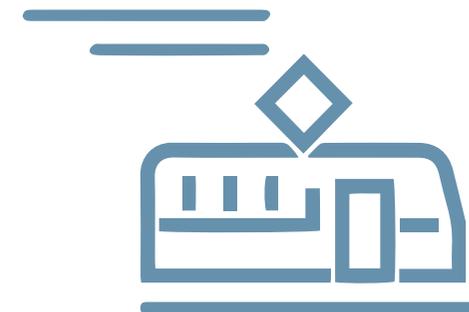
The supervisory statement from the Bank of England sets out expectations for banks, building societies, insurers and reinsurers to take a strategic approach to climate change, and assess the financial risks stemming from the impacts of climate change on their lending activities (PRA, 2019). Programmes such as the Carbon Disclosure Project provide a platform for companies to report and disclose climate change risks, but now two thirds of the UK's top 500 companies are expected to report their physical risks in 2019 through TCFD guidelines (Carbon Trust, 2019).

Alongside this focus, public policy and regulation is also increasing expectations for managing climate risk, with the Climate Change (Scotland) Act 2009

placing duties on public bodies to mainstream consideration of adaptation issues. Land use and planning is a key component here, and the third National Planning Framework already requires consideration of climate resilience and adaptation (Scottish Government, 2014).

Major infrastructure and urban development projects require an Environmental Impact Assessment (EIA) as part of the planning process. The EIA shows how certain types of new development will affect their surrounding environment and must include solutions to minimise any negative impacts. The 2017 EIA regulations require climate adaptation to be addressed explicitly (Scottish Government, 2017).

Taken together, the evolving framework for climate-related finance means that the public institutions involved in place making, as well as public and private developers seeking to borrow to build will increasingly have to articulate the climate risks to a site/project, and illustrate how their project has addressed and adapted to them.



## Why adaptation makes good business sense

Considering climate change in regeneration and new development projects makes sense from a wide range of perspectives, which go to the heart of any successful project:

▶ **Operational** – A changing climate has the potential to directly impact on the ability of projects to realise their core purpose and planned benefits – for example siting buildings in areas at risk of coastal flooding under future climate scenarios may limit the potential to perform long-term functions, or for staff to access it. Similarly, overheating buildings can reduce productivity, affecting overall delivery of services.

▶ **Financial** – Climate change has a bearing on the overall financial models and business cases for projects, increasing costs from disruption or affecting revenues or yields. For example, a longer growing season or more frequent and extreme weather can affect maintenance regimes, whilst warmer temperatures may reduce heat demand or increase cooling demand. Understanding such changing requirements helps you plan for variations in capital and operational expenditure over time, as well as understanding whether different adaptation options represent good investments. Early investment in adaptation measures can help to avoid costs later but will also affect the net present value and benefit-cost ratio. There are also broader financial benefits; considering climate risks can also improve access to and reduce the costs of capital, support diversification of investors, and increase overall company value.

▶ **Reputational** – Failure to take account of climate risks and weather disruption has the potential to result in significant reputational damage when damage to buildings and assets occur – something which is harder to repair than the buildings themselves. Clear and transparent disclosure of climate risks and plans to manage these build investor confidence, reassure shareholders and support strong relationships. In some cases building resilience to climate impacts can also be seen as a way to distinguish the company in the wider marketplace.

▶ **Compliance** – Extreme weather events could affect the ability of your site to comply with various statutory duties or regulatory conditions (for example in terms of accessibility, work environment or required outputs).



## Funding and finance innovations to support early adoption

The increased recognition and awareness of climate risks in the financial sector mean that requirements for climate risk assessment and adaptation actions will continue to grow and will increasingly become standard practice. In parallel, the industry is piloting the use of new financial products and services to support management of climate risks.

These innovations provide adopters with the opportunity to access funding (through direct capital) or financing (through loans) which support better, more resilient projects, bring down costs, and reduce the risks of default or incurring unplanned costs. The interest in projects that consider climate risk is growing rapidly. Examples of these innovations include:

- ▶ **Technical Assistance** – some financial services companies like the Green Investment Group or the European Investment Bank provide technical assistance grants to undertake climate risk assessments ahead of a major loan. These support development of the industry and reduce the risk profile of loans, allowing adjustments to be made to loan conditions.
- ▶ **Blended Finance** – To support early adopters and encourage the transition to adaptation thinking, the EIB has a dedicated adaptation financing facility, the Natural Capital Financing Facility, which blends grants and loans, while the EBRD launched a dedicated financing facility, CLIMADAPT in 2015. This blending helps reduce the overall cost of borrowing, and helps offer flexibility in repayment terms.
- ▶ **Green and Social Impact Bonds** – The concept of Bonds, or debt finance with a social or 'green' impact is already gaining a foothold with cities, financiers and institutional investors.

The oversubscription of the recent Paris Green Bond shows the appetite for climate-oriented investment in the international finance market. However, as an emerging field it is fast moving. Key challenges include defining the 'green-ness' of bonds and the Climate Bonds Initiative is shortly due to release Adaptation and Resilience principles. The other challenge is the significant resource and time taken to get a bond to market. That said, it can be extremely advantageous where lower rates of interest are needed, provided the overall scale of finance needed to make it worthwhile can be met.

The increased awareness of climate risk in the financial sector and requirements in legislation highlight a clear need for climate risk assessments to be developed for built environment and regeneration projects. It is also clear that these assessments can help projects achieve stronger outcomes and create opportunities to access innovative financing mechanisms which reduce the barriers to incorporating adaptation.



# Part 2: Identifying and managing climate-related project risks in practice

Climate risks can be effectively assessed and managed. In this section we set out concepts and guiding principles and describe a range of options for assessing climate risk across different project business case and design stages

## Concepts and guiding principles

Successful screening, risk assessment and adaptation for projects involves a number of core concepts and principles, including:

- ▶ Understanding the language of climate risk
- ▶ Understanding your own organisation's capabilities to manage climate risks
- ▶ Achieving wider progress in partnership
- ▶ Working with the long term in mind

### Understanding the language of climate risk

Providing clarity on risk assessment terminology and assumptions and engaging effectively with stakeholders from the outset will help ensure that you select the risk assessment process that is the best fit for your project. Crucially it will help to build support and shared ownership of the assessment process and results. Assessing climate risks involves using certain core terms and definitions. These are usually based on those used by the

Intergovernmental Panel on Climate Change, which define risk as a function of a range of components, as shown in Figure 1.

Being familiar with these terms is important to ensure you are able to work with others, and to understand the messages involved in key documents.

### Understanding your own organisation's capabilities to manage climate risks

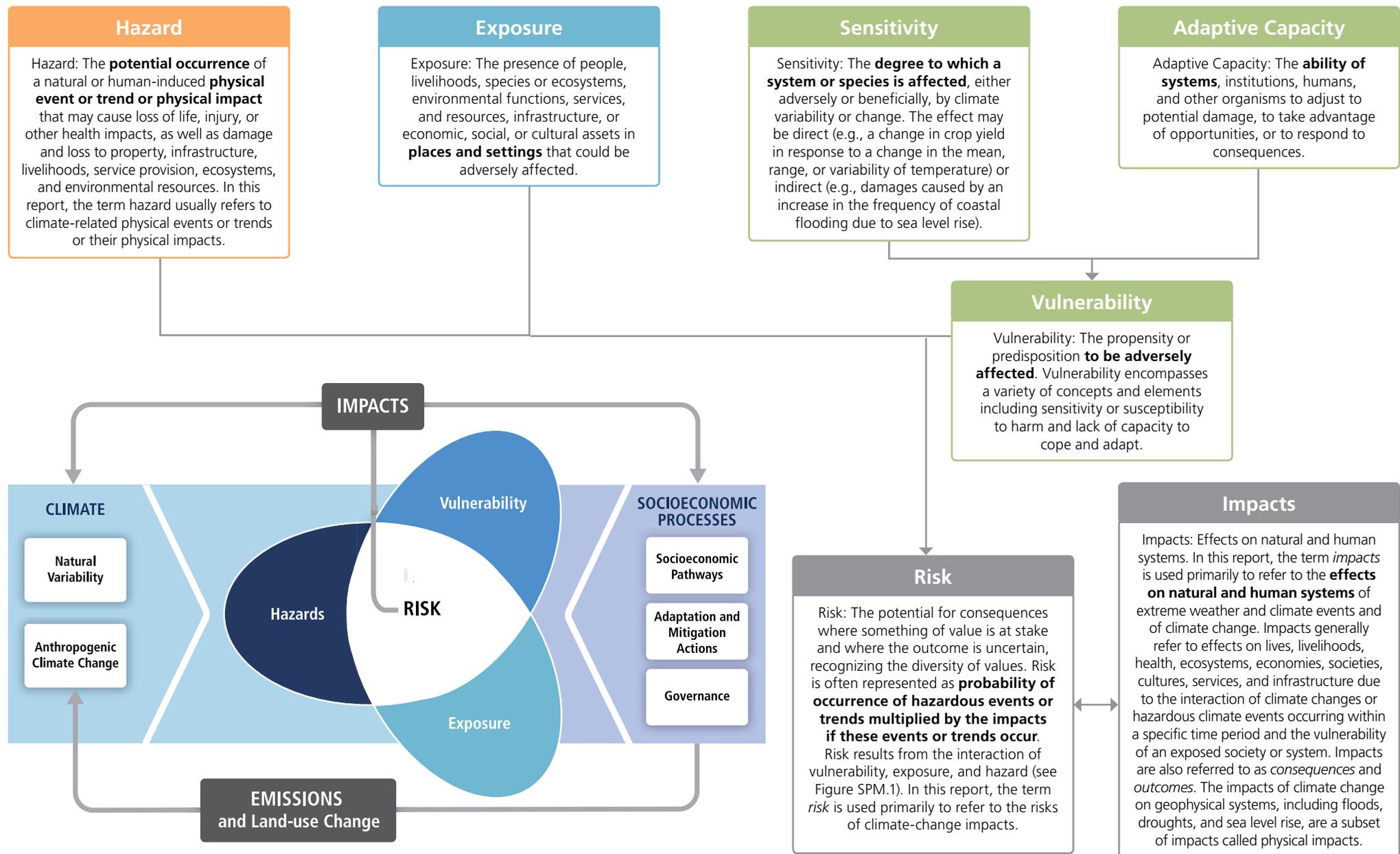
Your organisation will be affected by a wide range of climate risks and opportunities, extending beyond individual development and regeneration projects. It is important to identify the resources that are available in house to understand and respond to these risks and opportunities. In many cases staff will have skills, resources and competencies to enable you to respond effectively. There may also be a need to bring in external resources and expertise to provide training or technical support.

If you work in the public sector, you can use the Adaptation Scotland Adaptation Capability Framework and accompanying Benchmarking Tool to help understand your organisation's current adaptation strengths and weaknesses to help clarify project requirements. Similarly, organisations such as TRIOSS provide specialist services in benchmarking adaptive capacity of organisations and project teams in the private sector.

### Achieving wider progress in partnership

Working in partnership should be at the heart of managing climate risks to any project, and it is mainstreamed through the tools included in this guide. Uncovering the most important climate risks to a project and finding the best adaptation measures requires the support of the key stakeholders developing, delivering and operating the project in the future – such as the steering group, investors, lenders, politicians, etc. Once you have an understanding of risks, a partnership

Figure 1. Core concepts of Climate Change Risks. (Adapted from IPCC, AR5, 2014)



approach can help you manage them, as well as provide additional confidence that risks outside the scope of your control will be managed and minimised.

What's more, working in partnership with those close to a site or associated with managing the risks can uncover new ways to adapt to future risks that are often more effective or cost-effective. For example, taking on responsibility for highways adjacent to buildings or public space can allow more buildings to contribute to a SuDS systems. The Adaptation Capability Framework can support this through the Working Together capability and supporting tasks.

### Working with the long term in mind

Projects that deliver regeneration and development of the built environment have a long term legacy and therefore influence health, wellbeing and sustainability over many decades. Present day development and regeneration projects will have to respond to significant changes in climate over their lifespan. It is crucial that both current and future risks are factored in to project planning and design. Failure to take account of climate risks could 'lock in' significant challenges. For example decisions

such the location and structure of buildings are very difficult to reverse or adjust in light of emerging climate impacts such as increased flood risk or overheating.

It is possible to use concepts of decision making under uncertainty to enhance resilience during project design. Options include:

- ▶ **No-regret design** – actions that deliver benefits regardless of future climate change;
- ▶ **Flexible design** to allow later upgrade more easily (e.g. oversizing foundations of flood defences);
- ▶ **Iterative design** – to monitor and learn – with the option to upgrade later if needed;
- ▶ **Robust design** (now) to perform well over a wide range of future uncertainty (e.g. different emissions scenarios);
- ▶ **Shortening design** lifetimes so they can include climate in future cycles;
- ▶ **Precautionary over-design** if reasonable (for example in critical infrastructure).

Selecting the measures will be a trade-off between future climate, risk appetite, and the economic viability which will be a matter for discussion as part of developing any adaptation plan.

## The three-step process: climate screening, assessing climate risk and implementing adaptation

Completing a climate risk assessment normally comprises three stages:

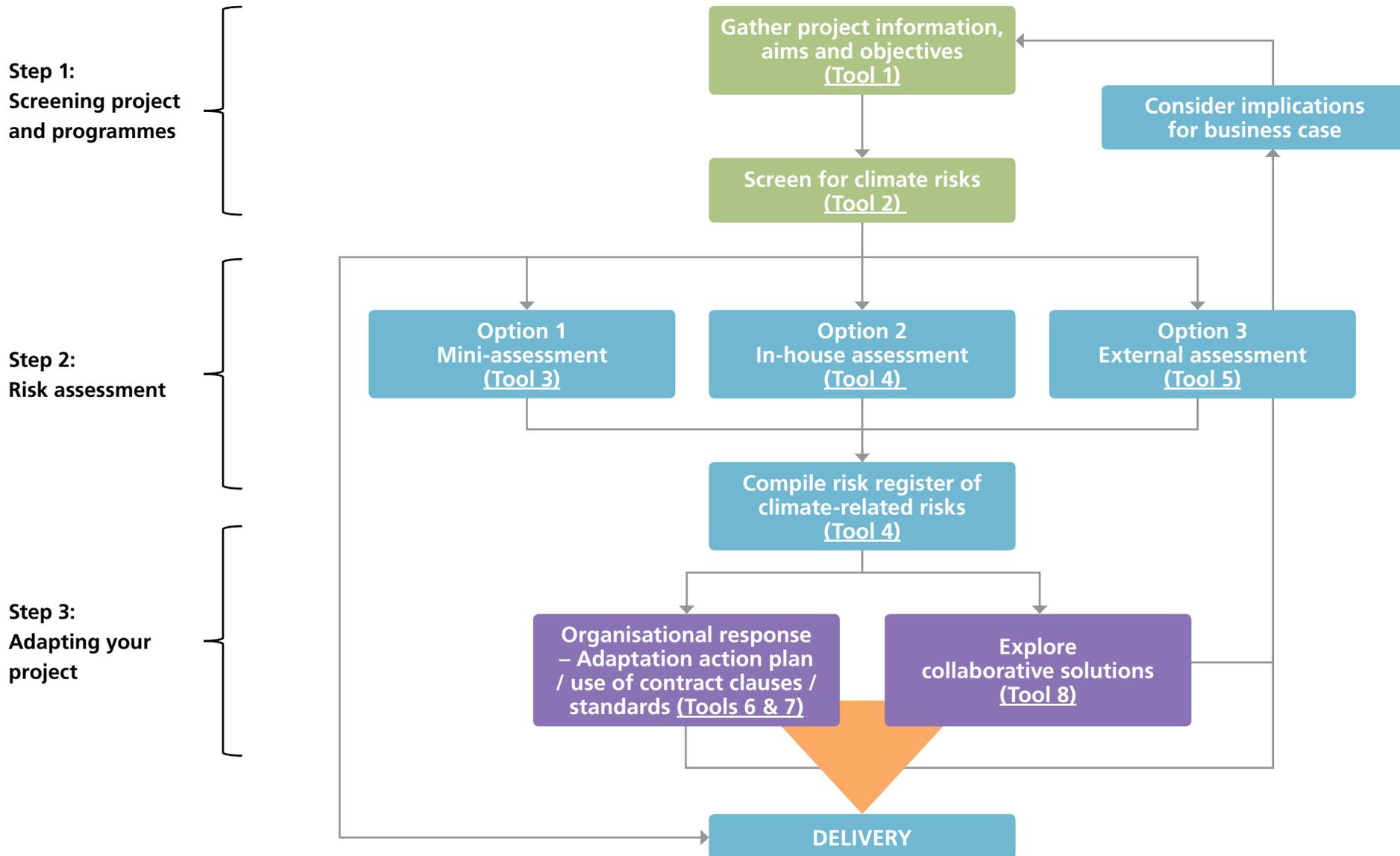
- ▶ Step 1: Setting ambitions and screening – Conducting a high level review of projects to identify potential climate risks early in the project
- ▶ Step 2: Identifying climate risks through risk assessment – A more detailed consideration of climate risks and identification of adaptation options through an in house assessment or commissioned piece of work
- ▶ Step 3: Incorporating adaptation – Embedding adaptation into the project design and delivery

In this section of the guidance we provide a comprehensive set of tools and resources to support screening, and risk assessment across project design and delivery cycles.

Figure 2 provides a flow chart showing the three stages and associated activities. Each of the stages are summarised in the following section and links provided to accompanying tools and resources.

Table 1 provides a summary of the risk assessment tools and resources and describes how they relate to two key frameworks in the project design and delivery cycle; HM Treasury guide for business cases (HM Treasury, 2018), and the RIBA plan of work, including the green overlay (RIBA, 2014).

Figure 2. Flow chart of climate screening, risk assessment and incorporating adaptation for projects



Download all accompanying tools, templates and instructions from the **Adaptation Scotland** and **Climate Ready Clyde** websites or email [adaptationscotland@sniffer.org.uk](mailto:adaptationscotland@sniffer.org.uk)

**Table 1: Summary of risk assessment tools and resources and business case/ design stage**

Tool	Business case / design stage												
	Treasury Business Case Stage					RIBA Plan of work stages							
	Project start up/Feasibility	Strategic Outline Case	Outline Business Case	Full Business Case		0 – Strategic Definition	1 – Preparation and Brief	2 – Concept Design	3- Developed Design	4 – Technical Design	5- Construction	6 – Handover and Close Out	7 – In Use
<b>Step 1: Setting ambitions and screening projects and programmes for climate risk</b>													
<b>Tool 1</b> Project Information and Adaptation Aspirations Template	✓	✓				✓	✓						
<b>Tool 2</b> Climate Screening Template	✓	✓	✓			✓	✓	✓					
<b>Step 2: Identifying climate risks through risk assessment</b>													
<b>Tool 3</b> Mini Risk Assessments	✓	✓	✓			✓	✓	✓					
<b>Tool 4</b> Risk Assessment Workbook		✓	✓	✓			✓	✓	✓	✓			
<b>Tool 5</b> Model Invitation to Tender			✓	✓				✓	✓	✓	✓	✓	
<b>Step 3: Incorporating adaptation</b>													
<b>Tool 6</b> Design brief and contractual clauses			✓	✓		✓	✓	✓	✓	✓	✓	✓	
<b>Tool 7</b> Adaptation options library	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
<b>Tool 8</b> Stakeholder Enlargement workshop facilitation plan	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓

Download all accompanying tools, templates and instructions from the **Adaptation Scotland** and **Climate Ready Clyde** websites or email [adaptationscotland@sniffer.org.uk](mailto:adaptationscotland@sniffer.org.uk)

# Step 1 – Gathering project information and screening projects and programmes for climate risks

Understanding a project's overall aims and objectives and screening them for climate risks are important first steps to determining the level of climate risk assessment and adaptation planning required.

 <b>Financial cost:</b>	Low
 <b>Staff time required:</b>	Three to Five days
 <b>Skills needed:</b>	Communications, Stakeholder engagement, broad understanding of climate impacts
 <b>How it can be undertaken:</b>	Half day workshop, 1-1 discussions, desk-based review
 <b>Stakeholders required:</b>	Project board, relevant external partners
 <b>Relevant business case stage(s):</b>	Project start-up/feasibility, Strategic Outline Case, Outline Business Case
 <b>Relevant RIBA stages(s):</b>	0 -2

## Understanding the project and setting out adaptation aspirations

Gaining approval and buy in for incorporating adaptation into a project needs to be based on a strong understanding of how it adds value to the project's overall aims and objectives and key characteristics. Therefore, a pre-requisite to agreeing to any screening or assessment of climate risk is to ensure there is a strong understanding and documentation of the project's main objectives and intended benefits and how it is to be delivered, alongside how it could be affected by climate risks, and a possible response.

You can use the *Project Information and adaptation aspiration template* to set out this information, and outline how and why adaptation will be incorporated in to your project. The template requires project officers to complete sections on

the overall project aims, governance and delivery approaches, a high-level consideration of how climate impacts could affect outcomes and outputs, and an overall statement of adaptation aspirations.

In many cases a Project Initiation Document (PID) will be available for the project which will provide most of the information needed to support development of a statement of aspirations. Where there is no project PID, or if those responsible for considering climate implications are new to a project, the *template* provides sample questions to ensure all essential information is gathered.

Completing the template offers a good opportunity to engage the project board and other key members of the delivery team early in the project, allowing you to raise awareness of climate risks and build broader support. You can complete the *template* through hosting a short workshop or by holding a series of 1-1 discussions.

The statement should be completed in conjunction with those who 'own' the various high-level climate

risks, for example those who stand to lose money if the project is affected by a climate event. It needs to be approved by those responsible for overseeing and delivering the project, such as a project board, sponsor or director. Ideally this support should be in place from project initiation, but can occur later, such as at the feasibility stages.



**Relevant tool: Tool 1 – Project information and adaptation aspiration template**

**Screening projects for climate risks to inform risk assessment and adaptation approaches**

For all projects, there is a need to ensure that a proportionate approach to assessing risks and developing adaptation options is taken, in line with planned levels of investment, the lifetime of the asset and the degree to which it becomes costly or difficult to reverse decisions taken. Screening a project for climate risks at an early stage (for example when being scoped, or during initial feasibility) provides an initial assessment of how

climate change could impact your project and determine whether further work is required. It is commonly used by development banks, and organisations undertaking large scale investments, and can help refine development of the business case, highlighting key issues for consideration.

The *Climate Screening Template* provides a way to conduct a high-level screening of a project for potential climate risks. Answering the questions will also give you a sense of the capacity of your organisation to work with adaptation. This approach ensures the broader economic and social development benefits are delivered, and demonstrates to investors that these issues are addressed. Once completed, the screening can be considered by a project's board or steering group to inform a decision on the next steps needed to ensure an appropriate means of assessing and addressing climate risks.



**Relevant tool: Tool 2 – climate risk screening template**

## Step 2 – Identifying climate risks through risk assessment

The aim of step 2 is to identify key risks that that climate change poses to the project and the business case. The output will be an assessment which can be used to respond to relevant climate risks.

The depth and breadth of a climate change risk or opportunity assessment for a project will vary depending on a range of factors, including the project location, size and complexity, the potential risks and the level of assurance required by project owners or funders. It will also be influenced by the level of funding, time, skills and resources available to complete the assessment. We have identified three risk assessment options ranging from a very basic mini-assessment through to a comprehensive consultant-led assessment:

► **Option 1: climate risk and opportunity mini-assessment** – A light-touch assessment focused on holding a short discussion/workshop to identify the impacts of historic events and perceived risks. This type of assessment can raise awareness of climate risks for projects where adaptation has not been addressed, and where there are currently no resources available for incorporating adaptation.

► **Option 2: In-house climate risk assessment**

– An internal, practitioner led process using in-house knowledge and expertise. This is the best option where there is significant in-house knowledge, expertise and capacity, and where independent assessment isn't necessary. The process can be done by a project manager or sustainability officer supported by an external consultant.

► **Option 3: Commissioning a climate risk and opportunity assessment**

– Expert consultant input may be required for complex projects such as major infrastructure and developments, where there are time or resource constraints, or where the scale of the investment or the funder calls for an independent climate risk assessment as a financing condition. This guidance presents a model project brief for the consultant not only to do an assessment of climate risks and opportunities but also to do an assessment of the adaptive capacity of the organisation delivering and operating the project.

The output of the three methods will differ in level of detail. But each will provide a project board with an understanding of the ways that climate change could put a project at risk, and a documented decision on how these risks will be managed. The following section provides an overview of each option and signposts to relevant tools, templates and detailed instructions.



## Option 1 – Climate risk and opportunity mini-assessment

 <b>Financial cost:</b>	Low (in house resources)
 <b>Staff time required:</b>	Two to three days
 <b>Skills needed:</b>	Workshop facilitation, practical understanding of weather impacts
 <b>How it can be undertaken:</b>	Half day workshop
 <b>Stakeholders required:</b>	Project working group to participate in workshop. Steering group to decide how to address the risks that are identified (the conclusion of the workshop may also be that more knowledge is needed in which case the steering group should decide how to attain this knowledge).
 <b>Relevant business case stage(s):</b>	Project feasibility/start up, Strategic Business Case, Outline Business Case
 <b>Relevant RIBA stages(s):</b>	0 -2

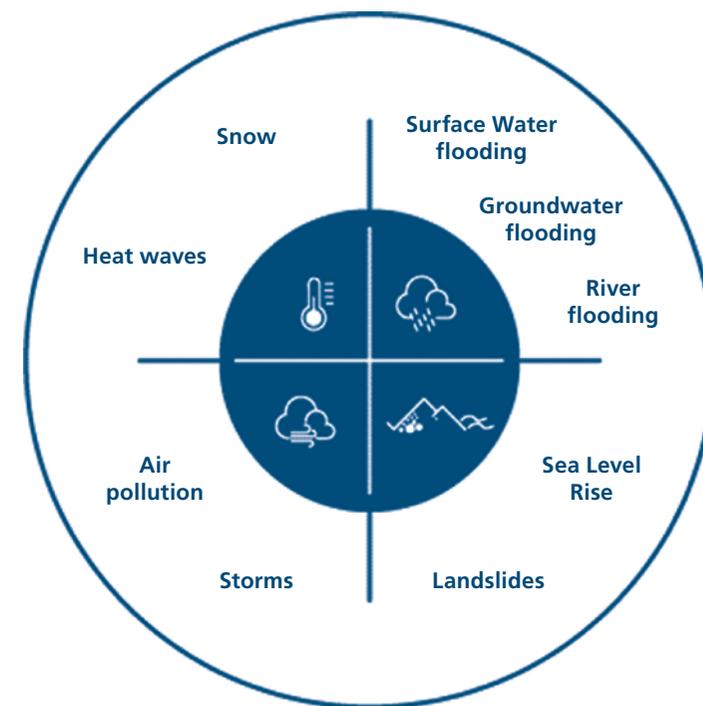
### Overview

A simple way to begin addressing your project’s climate-readiness is to explore and document how the project would be affected by an extreme weather event through a group discussion or workshop with a project board, or key stakeholders.

Feedback and learning from the discussion or workshop should be applied at feasibility stage,

before detailed options have been developed. Work undertaken in step 1 to agree a statement setting out adaptation ambitions and to screen a project for potential climate risks should have laid the ground work for engaging stakeholders and securing participation in the discussion/workshop.

The toolkit’s *mini-risk assessment template* is a conversation starter more than an actual assessment. However, a short, documented, group



discussion with the project board still serves a useful purpose – it will be able to shed light on relevant project risks, reveal knowledge gaps and identify external actors that need to be involved to ensure the long-term resilience of your project.



**Relevant Tool: Tool 3 – Mini risk assessment**

## Next steps

The discussion/workshop should create a shared understanding of climate related risks and their potential impacts for the projects. If the discussion identifies that your project, organisation and stakeholders are prepared for climate change and have robust adaptation plans in place it may not be necessary to proceed further.

If the discussion identifies that certain climate hazards could have significant economic, financial or operational impacts on your project and there isn't a clear plan for addressing them, you will need to build a business case for work to carry out a more detailed climate risk assessment (Option 2 or Option 3).

## Box 1: Example questions for a climate risk and opportunity mini-assessment

To illustrate how a mini-assessment could work in practice, the following questions provide examples of what might be asked amongst a group of stakeholders delivering a project in Glasgow City Region. In 2018 alone the region saw extreme rain, extreme heat and extreme snowfall:

### Extreme rain

- Is your site at risk of sewer flooding (may require getting in touch with Scottish Water) or river, coastal or surface water flooding (may require flood risk information from SEPA / Local Authorities).
- Are there natural points in the landscape where rain water would amass and how this would affect the proposed location of your project?
- Does the project depend on public transport connections that will stop running during a heavy burst of rain?

### Extreme heat

- Are future warm summers a risk to your project?
- What are the key impacts? Could they cause lower productivity in over-heating office buildings, discomfort for residents, or health risks for vulnerable citizens such as children and elderly
- Could a sudden surge in electricity use for cooling cause your electricity supply to break down?

### Snow

- Will your project keep functioning even in 40 cm of snow?
- Who will be in charge of clearing snow, what machinery do they need, and is your organisation prepared for this?
- If existing buildings are being renovated in your project will the roofs have sufficient load capacity for an extreme snow event?



## Option 2 – In-house climate risk assessment

 <b>Financial cost:</b>	Medium
 <b>Staff time required:</b>	1-4 weeks (over a longer period)
 <b>Skills needed:</b>	Workshop facilitation, high level understanding of climate events and climate impacts, detailed knowledge of project performance factors and regional climate projections.
 <b>How it can be undertaken:</b>	Desk-based research for project information and three optional workshops to a) define the project's critical elements and set boundary of assessment, b) determine relevant climate risks (as a result of a vulnerability and exposure assessment), and c) determine climate-related project risks.
 <b>Stakeholders required:</b>	Project board, input from representatives in operations and maintenance. Project Steering Group to be sighted on partial conclusions, confirm final risk assessment and decide course of action.
 <b>Relevant business case stage(s):</b>	Strategic Business Case, Outline Business Case, Full Business Case
 <b>Relevant RIBA stages(s):</b>	1 – 5

### Overview

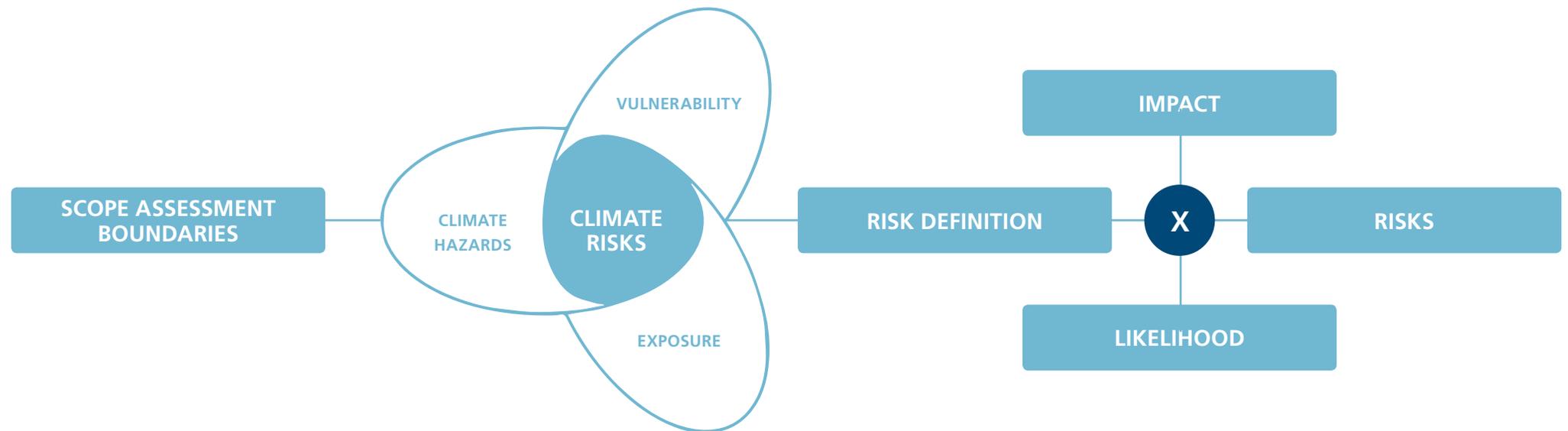
Completing an in-house climate risk assessment will build your organisation's skills, knowledge and confidence in assessing and managing climate risks. The outputs of the assessment can feed in to all stages of the business case and lay the ground work for developing adaptation actions.

The risk assessment workbook provided as part of this toolkit enables you to perform a comprehensive climate risk assessment of your project, in line with current best practice. It helps you identify climate risks by undertaking four activities:

- ▶ Defining the scope of an assessment;
- ▶ Assessing the likelihood of climate risks – related impacts to site, assets and activities, and transport links (due to vulnerability and exposure to climate hazards);
- ▶ Reviewing the risk likelihood; and
- ▶ Defining the potential impacts and risks and forming responses.

The workbook does not enable an assessment of a project board or organisation's wider adaptive capacity – i.e. the potential to implement the recommendations on climate risks. Whilst it is important that this is considered, there are a varied range of methods and processes to conduct such assessments and so it is out of scope of this guide.

Figure 3. The workbook process



The workbook is designed to be completed by an individual as a desk-based assessment or through a workshop-led process. In either case, engagement with the project team is vitally important to ensure an informed approach to identifying and scoring risks

In undertaking risk assessment using the workbook it is valuable to have any previous information collected (either through previous phases or other work) at hand to ensure that the risk assessment builds on the core project aims, and any understanding of climate risks to date.



**Relevant tool: Tool 4 – Climate and opportunity assessment workbook and handbook**

The Risk Assessment workbook is a excel template that can be used to complete a climate risk assessment. The workbook is provided with a detailed set of step by step instructions that guide you through each stage of completing a risk assessment. The key steps included in the workbook are summarised in Figure 4.

Completing the workbook will provide a clearer understanding of the potential for climate change to affect a project in the long term, enabling consideration of potential adaptation options. The output of the assessment will be a prioritised climate risk register that can be presented to a project board or steering group to support a decision for how to incorporate adaptation into a project.

Figure 4. Key steps from climate risk assessment workbook

**Step 1. Define the project and scope**

Enter basic information about the project and list all the assets and activities, inputs, outputs and transport links in scope of the assessment.

**Step 2. Assess vulnerability**

Assess the vulnerability of the on-site assets and processes, inputs, outputs, and transport links to weather conditions and climate change.

**Step 3. Assess hazard and exposure**

Assesses to what degree these elements are likely to be exposed to the listed weather conditions and climate hazards – today and in a future scenario related to the expected lifetime of the project.

**Step 4. Review risk likelihood**

Review the matrix to understand the most important potential climate impacts in the current and future climate.

Objective	Risk Description	Consequence	2019			Mitigation & Controls (Existing)	2050s			Treatment (Proposed)
			Likelihood	Impact	Risk Rating		Likelihood	Impact	Risk Rating	
Consider in terms of clear objective (e.g. corporate or civic)	Hazard and impact on the objective	More detail on the consequence								
Accessible to tourists	Floods 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 vegetation, etc.	3	3	3	Inspection regime and good housekeeping measures to help and working effectively. Emergency services 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 several co-ordinated and consistent multi-agency responses beyond the county. Flooding advice is given on the Council website and direct people to the relevant pages on the SRFs 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.
Resilient assets	Damage to roads, properties, harbours and natural heritage sites due to coastal flooding and erosion	Impact on public safety; damage needing repair; increase in claims against the Council, etc.								

**Step 5. Define risk descriptions, identify potential impacts and score**

Define the risks associated with these hazards and actions to manage them, assign impact and likelihood scores for current and future time periods, and assign risk owners.

## Option 3 – Commissioning a climate risk and opportunity assessment

 <b>Financial cost:</b>	High – between £10,000 and £75,000 depending on project size.
 <b>Staff time required:</b>	Minimum of one month staff time, over the consultant’s contracted period (N.B. Completion of this kind of assessment normally takes a minimum of 6 months).
 <b>Skills needed:</b>	Tendering and commissioning
 <b>How it can be undertaken:</b>	Varies – led by consultants – but broadly following the methodology described in model project brief.
 <b>Stakeholders required:</b>	Buy-in must be secured from steering group and relevant managers in the wider organisation to provide consultant with the information necessary to produce a full Climate Risk and Opportunity Assessment.

### Overview

An alternative solution to in-house assessment of climate change risks is to commission consultants to complete a dedicated climate risk and opportunity assessment. Such approaches might be appropriate for large or complex projects, if there are time or resource constraints, or if such assessments are required for insurance/assurance purposes.

The process of contracting a consultant to carry out a comprehensive climate adaptation risk and opportunity assessment differs between projects and organisations, depending on a range of factors including project budget, severity of hazards/exposure, and the range and complexity of project components. To support project managers who want to commission a risk

assessment and development of adaptation options in their project, a model invitation to tender (ITT) is included as tool 5.

The ITT is based on the approach taken by the European Investment Bank, which in turn is based on the EU’s Non-paper Guidelines on making vulnerable investments climate resilient” (European Commission, 2014). It normally takes several months for a consultant to complete such a risk and opportunity assessment and requires significant resources, making it primarily relevant to developers of projects with budgets of several million pounds.

One of the benefits of commissioning an external assessment is that it offers the opportunity to gain an outsider’s view of both the project *and* the

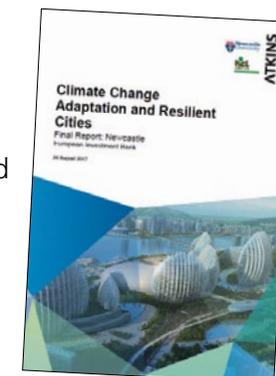
wider organisation. The model Invitation to Tender provided includes a requirement not only to assess the risks relevant to the project, but also to assess the adaptive capacity of the organisation. Some of the issues that will be explored in this section could include identifying:

- ▶ the preparedness of the parties within the project delivery and operation to implement identified adaptation options to address project risks;
- ▶ The ability of parties to prepare for, respond to, and recover from, known climate hazards in an emergency context;
- ▶ The adaptive capacity of the broader system that your organisation belongs to, e.g. its economy, industry, or its institutional and regulatory system.

 **Relevant tool: Tool 5 – Model invitation to tender**

### Next Steps

Whichever tool you use to complete your risk assessment, once it is completed it is important to communicate the findings back to the project board and key stakeholders to discuss the most appropriate next steps, including how to progress with developing and incorporating adaptation options.



## Step 3 – Adapting your project

Once project teams have a strong understanding of climate risks, there are a number of ways to climate proof the project to make it resilient to future climate change. These include in-house planning, effective contract management and understanding the effects of wider action by other partners.

### Overview

Screening projects for climate risks (and completing a risk assessment if required) is an important process to increase understanding of the ways climate change can affect the success of a project. The challenge now is to translate this increased understanding into concrete actions to increase the climate resilience of the project.

The delivery of built environment, regeneration and development projects most often happens in a dedicated project delivery organisation, or team. Delivering projects on time, within budget and to a sufficient quality requires Project Managers to set hard boundaries and deadlines for projects, meaning once the scope is set the possibility of including further adaptation is often limited.

In this context, there is often a push towards ‘value engineering’ – i.e. only considering climate hazards if required by law (such as flood risk) or if there is a short term benefit (such as funding opportunities). To overcome this, it is important to develop an

understanding of the possible benefits of adaptation alongside the broader business case, so as to demonstrate the continued value, across all stages of design and delivery.

Ensuring projects are climate resilient is not simply a case of better understanding and analysing climate risk. It requires effective leadership, governance arrangements, inclusive planning approaches and working beyond organisation and sectoral silos to ensure that solutions are agreed and implemented. As part of the public sector guidance, Adaptation Scotland has identified four capabilities that are key to successful adaptation:

- ▶ Organisational culture and resources;
- ▶ Understanding the challenge;
- ▶ Planning and implementation; and
- ▶ Working together.

This section of the guidance provides examples of how these capabilities can be developed and applied in the context of built environment and regeneration projects.

View Adaptation Scotland’s Adaptation Capability Framework for further details about tasks, guidance and case studies that show how these capabilities can be developed.

### Organisational culture and resources

To make progress with adaptation you need to understand and influence organisational culture and resources. This includes navigating and influencing decision making structures, developing leadership support at all levels of the organisation, securing resources and supporting learning and a flexible approach to adaptation.

In steps 1 and 2 of this guidance we set out the importance of having clear governance, accountability and ownership of the project risk assessment, as well as ensuring it links back to the broader project delivery. At this stage it is important to work with the project manager and project board to identify who will be responsible for ensuring that risks identified are addressed, with outputs used to develop and implement adaptation actions.

In addition, the learning may complement broader adaptation activities in the Adaptation Capability Framework:

- ▶ Identify where learning from the risk assessment can inform other projects, policies and procedures within your organisation. While the risk assessment that you have completed relates to a specific project, the risk assessment process and elements of the findings will be relevant to other projects and initiatives. Should similar assessments be completed for other projects that your organisation is responsible for? Has doing this process made it easier to repeat? How can learning from this assessment help build the case for this?
- ▶ Developing the risk assessment has involved engaging with a wide range of stakeholders. Are any of these stakeholders potential 'adaptation champions' who may be able to communicate and advocate for adaptation within the project or wider organisation? Consider how champions could be supported to influence adaptation action.

## Understanding the challenge

Adaptation is our adjustment to climate change, by understanding the challenge we can make informed decisions based on actual or expected change.

- ▶ Using new knowledge to drive action – The results of the risk assessment will provide you with an increased understanding of the

challenge. At this stage you should identify ways for the new evidence that you have generated to be used to inform the other capabilities.

- ▶ Identifying knowledge gaps – The risk assessment may have identified evidence and knowledge gaps. Look for opportunities to share learning and develop new evidence and knowledge through collaborations with researchers or altering the specification of follow on projects and initiatives.

## Planning and implementation

Adaptation is a long-term challenge that requires strategic planning and implementation. The two main options for embedding adaptation into individual projects focus on developing an adaptation plan for the project, or specifying appropriate standards and requirements as part of project briefs.

### Developing an adaptation plan for a project

You can use the results of a risk assessment or a screening as the basis for undertaking an adaptation plan. This should contain a range of actions designed to meet the key risk, as well as an assessment of the residual risk. The excel workbook (Tool 4) contains a risk and action plan template which can be used to identify existing actions in place and further actions required to manage

climate risks in the design, delivery and operation of your project. If you are commissioning an external climate risk and opportunity assessment you can also specify the production of an adaptation plan as part of this process.

In some cases, projects are already in the process of being delivered when climate change is highlighted as an issue. In these cases, the knowledge gained from a climate risk assessment should be incorporated as far as practically possible within the confines of what is still viable. This can be done by updating the requirements for project functions and (re-)defining thresholds for specific building components like backflow preventers, solar shading, and heating and cooling systems.



**Relevant tool: Tool 4 – Climate risk and opportunity assessment workbook (risk and action plan template)**

### Using clauses and standards in design briefs

Another way to embed adaptation is to include clauses in design or construction briefs which explicitly require consideration of climate change. These can be based on the key risks identified through your risk screening, through external evidence such as regional or local authority climate change risk assessments or SEPA flood maps, or by using generic clauses to allow a contractor to identify, select and deliver adaptation options.

**Box 2: Tool 5 – Example contract clause for consideration of climate change in a project brief**



“[The organisation] are keen to ensure that [the project] continues to operate as a high-performing asset over its [XX] year lifetime. Over the lifetime of the building [the area’s] climate is expected to be different from the present, meaning the asset needs to function in a changing climate. Therefore, our organisation will require successful bidders to identify and disclose key impacts and risks of future climate change, and propose adaptation solutions.

Whilst the assessment is expected to be comprehensive, key areas of focus should be:

- Ensuring thermal comfort under future climate scenarios
- Reductions of energy, and low carbon design, including changes in heating and cooling demand, and minimising demand for artificial cooling (e.g. through use of natural ventilation)
- the impacts on landscaping and green infrastructure, ensuring it is suitable for the lifetime of the building, with appropriate asset

management plans

- Increasing durability and resilience, in light of risks of more intense and frequent storm damage, wind, moisture and driving rain
- Flood risk from all sources (river, surface water and groundwater), including contributions of the site’s flood risk to other places, as well as flows onto the site
- Minimising water demand during periods of drought

The assessment should include a comparison of the lifetime costs and benefits of including such measures, and how they affect the overall viability of the business case, including the Benefit-Cost Ratio and Net Present Value. Applicants should propose a method to undertake the assessment (such as those outlined in the RIBA Green Overlay or BREEAM), and use appropriate data including UK Climate Projections 2018, SEPA flood maps which include an uplift for climate change, and supporting data such as CIBSE Weather Data files for future years.

Box 2 sets out a sample clause which could be adapted and included in design and construction briefs to highlight both the necessity but also the benefit of incorporating climate adaptation in a project. In addition, specifying relevant standards or assessment schemes can be a useful way to shorten the time needed to prepare a brief for contractors. Standards such as *BREEAM New Construction 2018 (UK)*, and *BREEAM UK Refurbishment and Fit out 2014 – Non domestic buildings* contain adaptation credits which address a range of issues, including thermal comfort, designing for durability and resilience, water efficiency, and passive heating and cooling. Whilst embedding clauses into design briefs can offer an effective route to embedding adaptation into a project, it won’t always be feasible for every size of project. What’s more, it’s important to realise that as adaptation is a relatively new requirement, some contractors may not be familiar with how to meet this requirement if asked and you may need to undertake some capacity building with them to implement this.



## Tool 6: Adaptation options library

There are a wide range of actions that can be implemented in a project, depending on cost, functionality, risk and degrees of modification. Both nature-based and technical solutions offer excellent methods for managing a range of climate risks and delivering wider benefits. The following section provides some examples of the types of actions that can be implemented to ensure projects are climate resilient into the future.

### NATURE BASED ADAPTATION SOLUTIONS



#### Green roofs

Green roofs are becoming more mainstream and provide a range of wider benefits: they absorb rain water, reduce air temperatures, increase biodiversity, insulate the building and are also beautiful to look at.



#### Multifunctional spaces, bioswales and rain gardens

Green street design can combine surface water management with improvements to the public realm that also manage climate hazards. Examples like the Commonwealth Village in Glasgow show the value of integrated thinking.



#### Green facades and edge zones

The spaces between and at the edges of buildings and street are often at risk of becoming uncomfortable urban heat islands. Green facades and entrances improves both micro-climate and urban realm.



#### Street trees

A line of trees adds quality and character to any street and helps stabilize micro-climate, minimise wind flows and reduce air-pollution. Modern planting techniques, such as the Stockholm method, have improved urban street trees' performance.



#### Salt tolerant planting schemes

Plantings close to pavements and streets can be made more resilient by choosing plants with high salt tolerance so winter maintenance doesn't damage them. An added benefit is that these plants are often also drought resistant.



#### Supporting walls

Supporting walls can reduce the risk of landslides and soil erosion. Integrating it in the landscape can bring added benefits, such as in Kay Alfred, Haiti where a recreational public space is integrated in the infrastructure solution.



## Tool 6: Adaptation options library

### TECHNICAL ADAPTATION SOLUTIONS



#### Flood resistant/resilient building components

Many elements of buildings can incorporate elements which help resist flooding or can use materials and components which minimise damage and aid recovery.



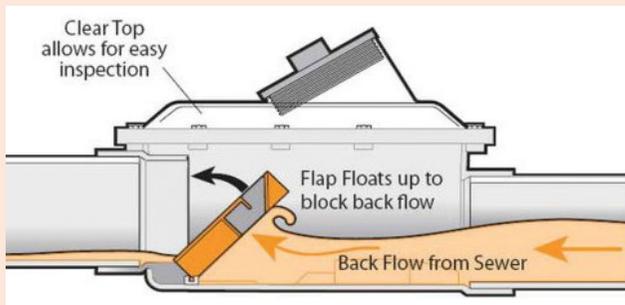
#### Flood walls

Flood walls are another way of securing assets at risk of flooding. Concepts like Le Mur create a soft, penetrable border between the sea and the city and keeps the streets dry when the tide rises, but only protect to a certain level.



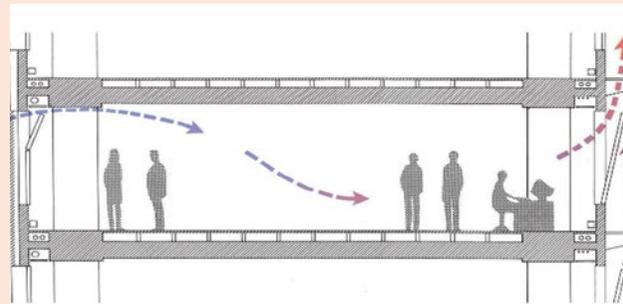
#### Solar shading

Shading can be a solution that keeps the building cool, minimises turbulence and adds detail and architectural quality to a facade. Even if shading is not necessary from day one the option to add them in the future depends on what is designed today.



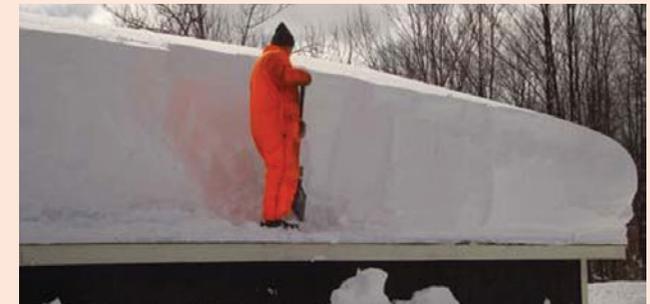
#### Backflow preventers

As part of reducing the risk of flooding to a building, ensure that sewer water will not flow back and flood basements in case of extreme rain. The simplest solution at building scale is a backflow preventer.



#### Ventilation

Natural ventilation design strategies can optimise building performance significantly without relying on mechanical solutions which means you are simultaneously saving energy.



#### Reinforced roofs

Adding extra capacity to the load strength of a roof can make it adaptive to changes in future needs – whether it is withstanding extreme snow fall or adding intensive green roofs and/or outdoor space to manage heat and run-off.

## Working Together

No organisation can adapt alone – by working together we can do more to achieve shared adaptation outcomes. By developing this capability you will forge connections with key partners to share ideas and find opportunities to collaborate.

Adaptation can and should happen at all geographical scales from the building level, through a masterplan scale to a regional/national scale. In some cases risks can only be effectively managed in collaboration with others. This is particularly true at neighbourhood or master planning scale, where risk assessments normally highlight that effectively managing risks requires engaging and working with external stakeholders including infrastructure operators, owners of neighbouring buildings and those responsible for the public realm. The examples of the Hafencity and Copenhagen Cloudburst Plan highlight the benefits of taking a joined up approach to adaptation.

### Box 3: Traditional and transformative solutions for adaptation

#### Joined up approach to adaptation

The two approaches presented below represent two different ways of incorporating climate adaptation in to large scale development and regeneration initiatives. One which focuses on adaptation within the business-as-usual form of project delivery and one which is, at its core, transformative. Both approaches are valuable and striking the right balance between them will be up to your individual organisation. Future-proofing individual projects will improve any long term investment, but it will not necessarily improve the resilience of the area or the region that the project sits in. Strategically re-defining your project to be seen as one piece in a larger puzzle of adaptation will benefit a wider region, but while it can mean synergies and savings it also risks adding complexity, and thus time, to the delivery of your project.



#### Traditional: Flood-proof Hafencity, Hamburg

When the City of Hamburg set out to redevelop their harbour it decided to future-proof the area to withstand river flooding. They used a site-specific building code, requiring all buildings to be flood resistant up to 8 meters, with new roads and bridges constructed to the same standards. By not building a new flood wall, and instead leaving responsibility to individual building owners, the area preserves the waterfront views and public access to the Elbe river which means plots can be sold at a high price, and yet even when the river floods, the Hafencity area remains open for business.



#### Transformative: Copenhagen Cloudburst Plan

The City of Copenhagen has taken a transformative approach to adapting the city to extreme rain. Instead of expanding the existing integrated sewer system, the Cloudburst Management Plan identifies 300+ projects to be constructed over the next 20 years at a cost of €1.5 billion. “Water boulevards” steer rain water into the ocean where it will not cause damage and new green “cloudburst parks” retain rain water from the sewer while at the same time improving the public realm in the communities that would otherwise be at risk of flooding.

## Stakeholder engagement

Stakeholder engagement is a key aspect of the risk assessment processes set out in Part 2 and where appropriate should include engaging with external stakeholders. Continuing this engagement process by sharing the results of a risk assessment can be a natural progression and support the process of working toward joined up adaptation plans and actions. The toolkit includes a sample facilitation plan for a stakeholder engagement workshop that aims to share the results of a risk assessment and stimulate discussion on opportunities for shared action to adapt.



**Relevant tool: Tool 8 – Stakeholder engagement workshop facilitation plan**

## Partnerships for adaptation

There are already a wide range of collaborations and partnerships in place in Scotland where organisations are working together to address climate risks at different scales:

- **Regional and City Adaptation Planning** – The Climate Ready Clyde, Edinburgh Adapts and Aberdeen Adapts initiatives are supporting city region adaptation planning.
- **Thematic Partnerships** – such as the Metropolitan Glasgow Strategic Drainage Partnership and the Glasgow and Clyde Valley Green Network Partnership allows public and private parties to join together to ensure that their separate investments in flood risk management and green networks work together and create synergies which are more cost-effective and offer improved climate resilience.
- **Project level** – Projects such as those showcased in part 3 have stakeholder engagement at their heart to maximise their ability to achieve adaptation goals and wider project benefits.



## Part 3: How Glasgow City Region is incorporating adaptation

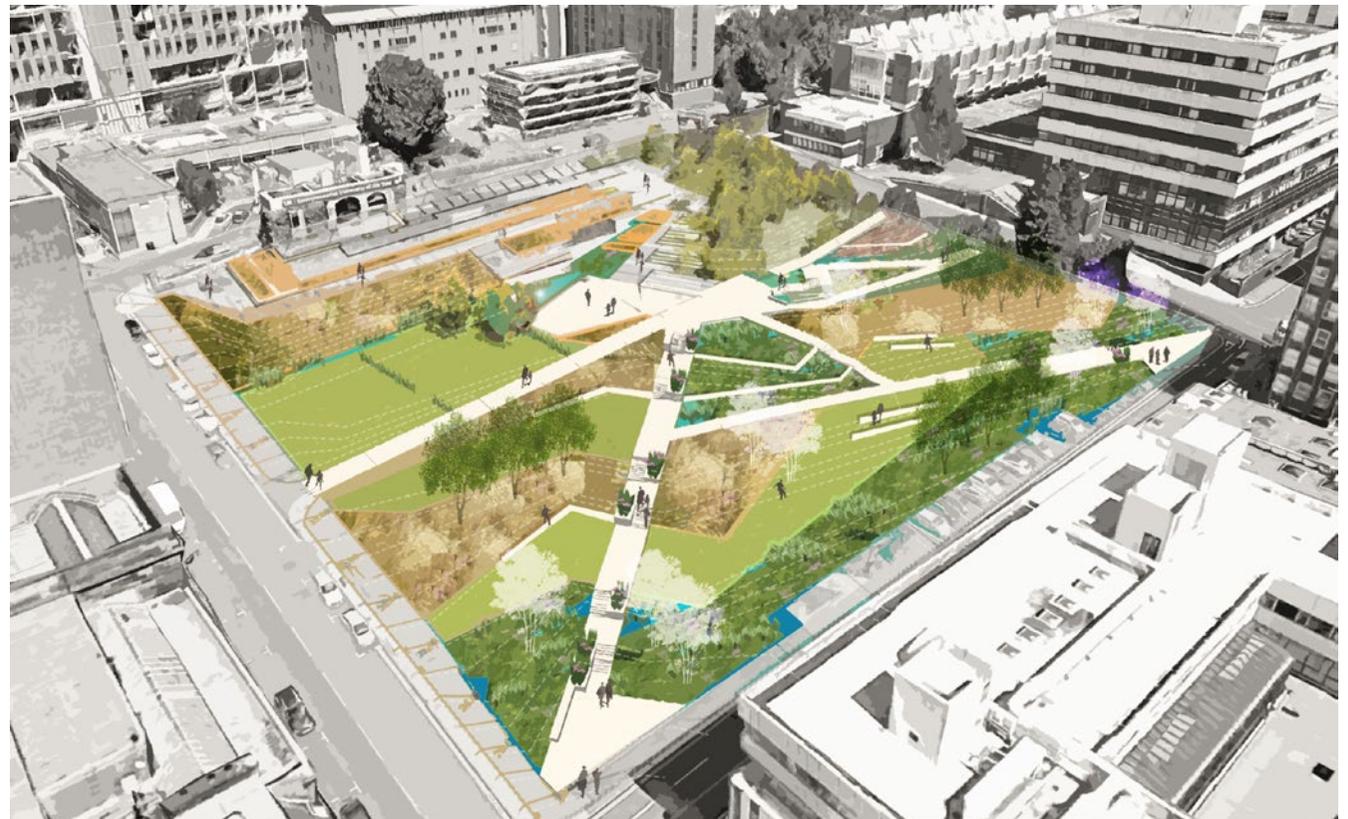
In developing this toolkit, Climate Ready Clyde worked with four projects in Glasgow City Region to incorporate climate adaptation using the tools and processes. The projects ranged in scale from an individual urban design project to a citywide regeneration strategy. Adaptation is happening in different ways and at many different scales, and the experience gained in Glasgow City Region should inspire other projects to incorporate adaptation in the future.

### Re-design of Rottenrow Gardens, University of Strathclyde

The University of Strathclyde are developing the campus around Rottenrow Gardens in central Glasgow. A new Learning and Teaching Hub is being built on the east side of the park and a combined heat and power (CHP) plant has been installed which runs through part of the park. Following this the university is re-designing the gardens to accommodate new users, improve flow through the area and demonstrate climate-ready urban design.

#### How is adaptation being included?

The design brief for Rottenrow Gardens initially focused on incorporating rainwater management. However, after running an adaptation workshop with Climate Ready Clyde and design consultant Peter Brett Associates, the understanding of climate risks has expanded to include a number of other factors, including the potential of the space to help manage overheating and thermal comfort for



**Sketch of Rottenrow Gardens with improved green spaces and the new Teaching and Learning Hub building on the right. Source: BMJ/University of Strathclyde**

neighbouring buildings. Another issue that arose during the conversations were maintenance issues and how a longer growing season and fluctuations in weather can increase maintenance costs.

### **What was/were the enabling factor(s)?**

The University of Strathclyde has a sustainability strategy for Estates which meant that the redesign of Rottenrow Gardens could include ambitions for adaptation. At the delivery of a phase 2 design, the project team and Climate Ready Clyde ran a workshop to uncover whether the relevant all climate risks had been covered – both risks and opportunities to the site itself but also to the projects' immediate surroundings. This led to a widening of the scope of the design to include not only surface water management but also to incorporate urban heat islands and issues of overheating in the Learning and Teaching Hub.

Furthermore, the workshop highlighted the possibility of partnering with Scottish Water or the Metropolitan Glasgow Strategic Drainage Partnership (MGSDP) to explore ways to divert run off from the roofs of nearby buildings out of the sewer system and into the rain garden and expanding the boundary of the design to include the streets between the building and park which were being adopted by University of Strathclyde.

### **What role has the toolkit had?**

The University supported development of, and piloted early drafts of the risk assessment workbook on the heart of the campus, whilst the workshop included a mini-risk assessment and a discussion on risks and opportunities in the surrounding area. It showed the value of using a holistic understanding of climate risks – both in terms of developing the best solutions for a project but also to draw attention to potential partners that may benefit from adaptation solutions and could be part of co-funding the project.

### **Which phases were the project most aligned to?**

The project already had an approved business case, however the mini-risk assessment strengthened this by identifying additional adaptation considerations to an ongoing construction project and by widening the scope of the project to include external parties' issues.

### **How is adaptation approached at different levels of the organisation?**

University of Strathclyde are an ambitious actor in terms of sustainability and in particular on climate adaptation. Whilst a demonstration project, Rottenrow Gardens shows how adaptation thinking is being adopted at all levels within the organisation. The project provides a potential platform for the University to advance its work by mainstreaming adaptation scoping in all future construction projects. The University also recognises the added value of a collaborative approach and are members of Climate Ready Clyde, and thus part of accelerating the transition to a climate ready city region.

### **What will happen going forward?**

The project is being developed and architects and engineers are progressing the detail of the designs. The outcomes of the ongoing dialogue between the University and MGSDP will determine to what degree the potential for broader adaptation measures is realised but support for the project is widespread.

## The South City Way, Sustrans and Glasgow City Council

With Scottish Government funding, Sustrans supports the delivery of active travel infrastructure in Scotland and is working with Glasgow City Council (GCC) in delivering the South City Way. The South City Way is a cycling connection between Glasgow city centre and Queen’s Park. The project’s main objective is to get more people to use sustainable modes of transport when travelling in Glasgow but also includes improving street design to create a better environment for walking, shopping and spending time.

### How is adaptation being included?

Sustrans has funding for hard infrastructure (hard standing, curbs, pavements) and for place -making in the shape of seating, street trees, public realm improvements. Green infrastructure is part of the “wish list” for the project, however there are many challenges in delivering new green infrastructure in a dense city – an important issue is that Glasgow City Council (like many councils in the UK) does not have extra funds to maintain new green spaces.

### What was/were the enabling factor(s)?

Sustrans has updated their briefs so they now explicitly ask for projects that incorporate green infrastructure in their future street designs to achieve both the ecosystem benefits (cleaner air, biodiversity, biological corridors, etc.) and to improve the experience of active travel by making the public spaces more attractive.



## GREEN SPACE OPPORTUNITIES MAP



**CURRENT FUNCTION:** BLOCKED UP ROAD ENDS  
**POTENTIAL FUNCTION:** USEABLE SPACE FOR LOCAL PEOPLE & BRINGING GREENERY TO STRETCH OF ROUTE  
**SUGGESTED IMPROVEMENTS:** ENHANCE POCKET PARK SPACES FURTHER WITH PLANTERS/ADDITIONAL TREE PLANTING



**CURRENT FUNCTION:** UNUSABLE GRASSED AREA  
**POTENTIAL FUNCTION:** GREEN BARRIER BETWEEN CYCLEWAY AND MAJOR ROAD/PETROL STATION  
**SUGGESTED IMPROVEMENTS:** PLANTING PALETTE DEVELOPED TO ENHANCE BIODIVERSITY & CREATE FUNCTIONAL SPACE

The South City Way. The illustration by Sustrans shows a mapping of potential new green spaces.

The South City Way project did not include significant green infrastructure from the outset. Sustrans and Glasgow City Council have since been working together to develop this aspect of the proposals but a number of factors have resulted in this being challenging to deliver.

### What role has the toolkit had?

Climate Ready Clyde supported Sustrans in building an evidence base for green infrastructure to use in the project delivery group and steering group. The main method has been mapping opportunities and risks. The mapping identified possible locations for green spaces and large areas of hard standing that could be transformed into green space (and which today present a potential urban heat island) but also focused on locating resources in the form of existing maintenance budgets and future construction projects (with requirements for surface water management) to ensure they were manageable for the long-term.

### The mapping:

1. Points out existing green spaces that are already maintained by Glasgow City Council and where the ecosystem services and recreational value of the space could be improved without new maintenance costs.
2. Locates number of green spaces that are currently maintained by Glasgow City Council but that could be transferred to other actors (for example housing associations). This would free up resources

to let GCC shift maintenance to new green spaces along the South City Way.

3. Found green spaces owned and maintained by other actors than Glasgow City Council where Sustrans might fund an improved green space and maintenance would stay with the owner.
4. Shows a number of development sites where the possibility for including green infrastructure could be part of a new developments' statutory flood risk and surface water management requirements.

Furthermore the business case for green infrastructure was strengthened by advancing the argument that proper establishment is a necessary part of investing in green spaces. The yield of investing in a tree is higher if the tree thrives. It may be cheaper to dig a small hole but if the tree dies after a few years the investment is pointless. Ensuring good growth conditions is therefore a necessary part of achieving a healthy long-living tree which grows a large canopy and provides the recreational and eco-systems value that is the purpose. In this instance there is an argument that the costs related to ensuring proper establishment and growth should be seen as a capital expenditure and that the first year of maintenance should not be considered part of Glasgow City Council's maintenance budget but part of the contractors' delivery budget.

### Which elements of the toolkit were most relevant to the project?

The first phases of the South City Way project were already in construction when Climate Ready Clyde

got involved so it has mainly been supporting the project team in building a business case for including extra green infrastructure in the coming phases and ensuring that the green space that was sketched also ends up being built. Mapping was a useful method in this regard.

### How is adaptation approached at different levels of the organisation?

During the process the support for green infrastructure has grown in the project group. The initial concerns around maintenance have been alleviated by mapping of potential partners and external resources.

### What will happen going forward?

By mapping existing green spaces and opportunities for new areas of green infrastructure, the project group was able to prioritise possible locations for greenery depending on the likelihood of a proposal being built and maintained and based on the potential for improving local climate conditions.

The experience gained will be used in another Sustrans/GCC project, "Connecting Woodside", where the early adoption of risk and opportunity mapping may give the project possibilities for partnering with private actors and developers earlier in the project development to support its success in this regard.

## Estates and Commercial Services, University of Glasgow

University of Glasgow are re-developing a range of sites in Glasgow to renovate the campus and ensure it is fit for the student offering. These include the 30 Ha site of the former Western Infirmary and a new Govan campus on the banks of the Clyde which will be home to a centre of nanotechnology and precision medicine. These will strengthen the University by improving and consolidating university functions and creating a vibrant public realm that brings students, staff and neighbours together on the university grounds.

In recent years, adaptation has been an increasing priority for the University, and they have begun to systematically implement consideration of climate risks into their capital investment processes.

### What was/were the enabling factor(s)?

Partly due to the findings from Climate Ready Clyde's risk and opportunity assessment, adaptation has been an emerging priority within the University. The University used the assessment to underpin the development of an adaptation strategy for the organisation. Following this, adaptation is increasingly becoming mainstreamed into the University's way of working. With this in place, they began to look at the priorities for delivery, and Long term investments which are difficult to retrofit were high on the agenda.



**The Western Infirmary development will bring the University of Glasgow's campus together over the next 10 years. (Source: Arup / 7N)**

For the Western Infirmary Development adaptation has become part of the process over time. The early Masterplan points out some issues that need to be addressed such as surface water management, and the University has focused on adaptation measures that bring added-benefits to the development and to the area as a whole such as green infrastructure that serves both technical and recreational uses.

The procurement approach of partnering with a delivery organisation over the long term has also made it possible to improve the resilience of the development. By having Multiplex as the delivery partner for the whole development, the knowledge created in early projects (for example regarding design thresholds that are adaptable to future heat loads and levels of rainfall) can be more easily incorporated in future construction projects. The procurement and delivery model also spreads risk between the partners so that they share both gains and losses if a project goes over the expected budget. This enables all involved to build

capacity in both climate adaptation and high quality construction which will ensure that the £1 billion investment is future proof.

### What role has the toolkit had?

Exploring the development of the toolkit, through the lens of the Western Infirmary helped University of Glasgow understand the benefits of adopting a climate screening approach and some of the tools and approaches (such as BREEAM adaptation credits) were incorporated into its adaptation strategy. Over the course of its development, Climate Ready Clyde and the University ran a training session with internal design teams to raise awareness of likely future requirements. An early version was shared with the design teams for the Govan campus to stimulate early thinking. But equally, the University provided really helpful and useful feedback on the tools and methods being developed, including a sense-check around the challenges of implementing such an approach in-house.

### Which phases were the project most aligned to?

Climate Ready Clyde has worked with the University of Glasgow in the risk screening phase, attending workshops to build capacity with those involved in the development of the site to use the tools. However adaptation is increasingly being incorporated in both projects in construction today and in the scoping of projects that are about to start their design phase.

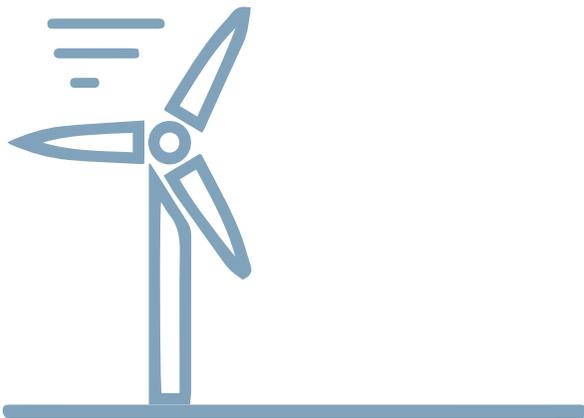
### How is adaptation approached at different levels of the organisation?

Adaptation is becoming increasingly mainstream in the University, and the most recent developments illustrate the golden thread emerging, where adaptation can be traced from corporate level down to individual actions to manage risks. With the University expecting to invest £1 billion over 10 years in the Western Infirmary development alone, as well as £115m (in partnership with Glasgow City Region City Deal) in the new Govan campus there is a growing understanding that the buildings and infrastructure must be made to function for generations to come.



## What will happen going forward?

The University will continue to work with the design and construction teams and project managers to implement a more robust and comprehensive approach to climate proofing new development. The University will be requiring BREEAM Adaptation credits in all new builds, as well as recommending the use of a climate screening approach as part of the internal design standards for buildings supported by the University's Estates and Commercial Services team.



Conceptual image of the new Govan campus. Source: University of Glasgow

## The Avenues project, Glasgow City Council

The Avenues project is one of the major infrastructure projects being delivered as part of the £1.13 billion Glasgow City Region City Deal. More than £115 million is being invested to improve the public realm as part of transforming the city centre. This project has five key objectives:

- Improving Connectivity - creating attractive points of entry and key corridors through the city with a pedestrian, cycling and public transport hierarchy;
- Improving the City Image - providing consistent and attractive public realm;
- Improving the City Economy - embracing innovative technology and futureproofing Glasgow's streets to support investment;
- Supporting Redevelopment - encouraging commercial, retail, leisure and residential property development; and
- Enhancing and protecting the Environment - greening the city through the provision of quality landscaping and green/blue infrastructure.

### How is adaptation being included?

Climate adaptation has been an integral part of the project from the beginning. Future proofing

Glasgow's streets with green infrastructure will help reduce the risks and impacts of surface water flooding and cool the city centre in face of rising temperatures and during hot summers.

The design briefs are based on ensuring sustainability and longevity for newly planted trees, rain gardens and having materials that are suitable for future weather conditions. Furthermore the additional benefits of the green adaptation solutions create a beautiful urban realm, which support the core economic objectives of the Avenues project.

For the pilot phase of the project on Sauchiehall Street, there has been an explicit emphasis to provide the right conditions for street trees to live and grow for many years. The societal and ecological benefits of street trees increases exponentially over time when their canopies grow. As an adaptation element trees deliver shade on hot days, cover in rainy days, absorb and evaporate rain water and clean the air, as well as improving the appearance of the streetscape.

### What was/were the enabling factor(s)?

The ambition of creating a better, greener, and climate ready city centre has been developing for several years. The project was developed as the Enabling Infrastructure – Integrated Public Realm (EIIPR) programme which includes references to a number of previous studies from the city region showing both the need for comprehensive surface water management solutions (some of which is being delivered by the Metropolitan Glasgow Strategic Drainage Partnership and is also partly funded by the City Deal) and showing the costs to the city of occasional overheating and impacts on productivity, health, maintenance costs and ecology. Adaptation is therefore part of the brief.



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# About Adaptation Scotland

Adaptation Scotland provides advice and support to help organisations, businesses and communities adapt to the impacts of climate change.

**Adaptation  
Scotland**  
supporting climate change resilience

This guide is part of a comprehensive set of climate change adaptation resources provided as part of Scotland Adapts: A Capability Framework for a Climate Ready Public Sector. Visit the Adaptation Scotland website to access all of our resources: <https://www.adaptationscotland.org.uk/how-adapt/your-sector/public-sector>



## The Handbook

– introduction to climate change adaptation for Scotland's public sector.



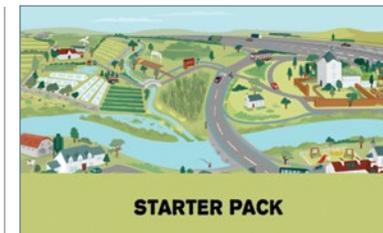
## Interactive Adaptation Capability Framework

– access detailed task information, resources and case studies.



## Online training modules

– develop adaptation skills and expertise.



## Starter pack

– for organisations and individuals who are new to adaptation.



## Benchmarking tool

– assess progress and plan adaptation work.



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Adaptation Scotland is a programme funded by the Scottish Government and delivered by sustainability charity Sniffer.

# About Climate Ready Clyde

Climate Ready Clyde is a cross-sector initiative funded by the Scottish Government and 15 member organisations to create a shared vision, strategy and action plan for an adapting Glasgow City Region.

1.8 million people live, work and play in the Glasgow City Region and a large number of businesses and organisations are based here, with £40bn of GVA – a third of Scotland’s population and wealth. Increasingly they are impacted by the effects of climate change, both directly in the city region, and from changes happening around the world.

Adaptation is a strategic issue for the city region in terms of securing inward investment and protecting the economy, as well as contributing to good place making, addressing inequality and minimising and avoiding costs arising from unplanned impacts. Climate Ready Clyde was established on the basis that adapting is cheaper, easier and more effective when done together.





# ClimateReadyClyde

Climate Ready Clyde  
c/o GCV Green Network Partnership  
125 West Regent Street  
Glasgow G2 2SD



[www.climatereadyclyde.org.uk](http://www.climatereadyclyde.org.uk)



@climareadyclyde



[climatereadyclyde@sniffer.org.uk](mailto:climatereadyclyde@sniffer.org.uk)

# Adaptation Scotland

supporting climate change resilience

Adaptation Scotland  
ECCI  
High School Yards  
Edinburgh EH1 1LZ



[www.adaptationscotland.org.uk](http://www.adaptationscotland.org.uk)



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[AdaptationScotland@sniffer.org.uk](mailto:AdaptationScotland@sniffer.org.uk)



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