LONDON climate ready PARTNERSHIP

Climate costs guide

A getting started guide to understanding the costs and savings of climate change impacts and adaptation

This Guide was supported by Transport for London. TRANSPORT FOR LONDON

Contents

We are keen to hear your views! For any feedback/questions on the Guide, please email: info@climatelondon.org

Introduction and context

Climate change is here and now

Impacts are already visible across London from heatwaves, flooding, storms and other extreme weather events. Climate change is costing London organisations through:

- **Damage to property and infrastructure**
- **Increased maintenance, repair and emergency response costs**
- **Reduced revenue from service disruptions**
- **Productivity losses**
- **Reputational and compliance failures**
- **Rising insurance premiums and liability risks**

What this means for London

The closely woven fabric of London life demands every organisation, community and business in the city's ecosystem to be empowered to take climate adaptation action in an equitable way and with the collective outcome in mind. Monetising the impacts of climate change and adaptation methods creates visibility of where inequities and imbalances exist. This allows climate funders and bodies to integrate or create mechanisms to redistribute resources and invest in adaption where needed in the system. Without this:

- **Climate adaptation remains under-resourced**
- **Climate risks are underestimated**
- **Long-term planning is harder to justify**
- **Opportunities for avoided losses and benefits are missed**
- **Adaptation is out-competed by other investment pressures**

Introduction and context

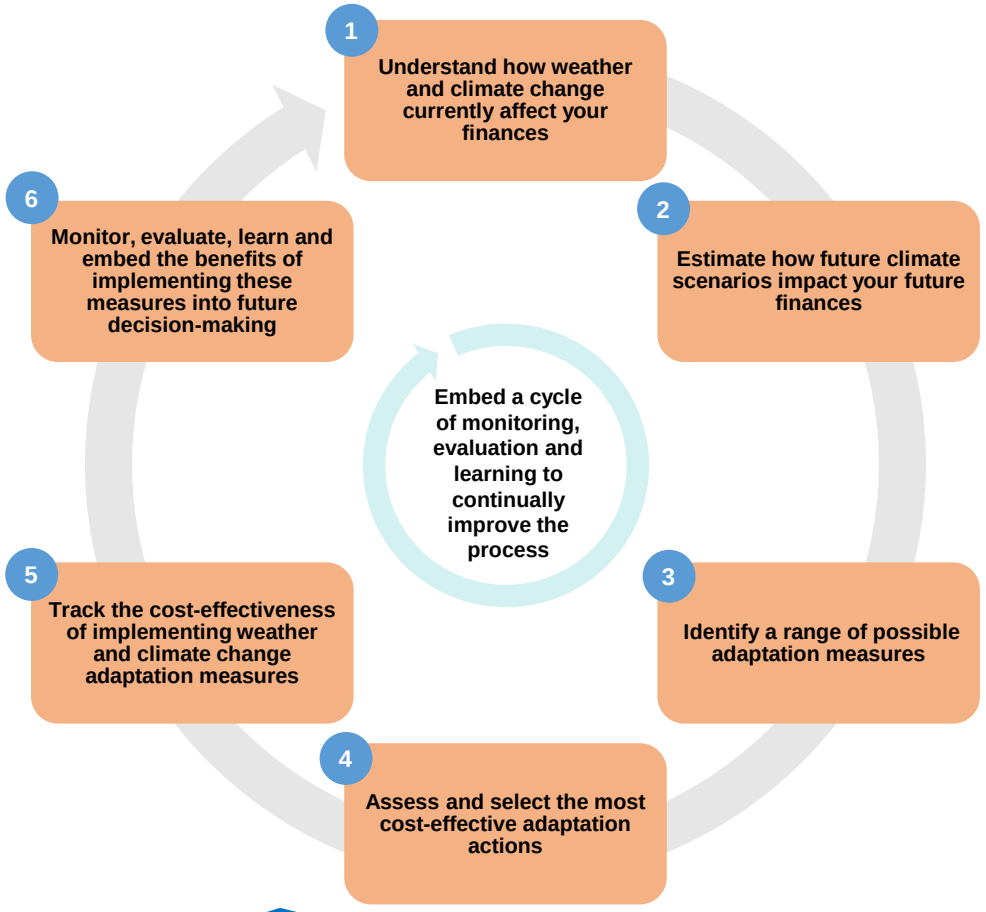
This Climate Costs Guide supports progression of recommendation 44 of the London Climate Resilience Review ("Commission work to strengthen the evidence base on the costs and benefits of adaptation and climate resilience"). The guide has been developed using the findings from a Climate Costs Forum held by the London Climate Ready Partnership in July 2025. The forum brought together London organisations to explore how weather and climate impacts translate into real financial costs, and how adaptation measures can create meaningful financial benefits. Participants shared several key recurring insights:

- Organisations and communities are already incurring significant, measurable **financial impacts** from climate-related events.
  - Many organisations **lack consistent systems** for recording climate impacts, particularly linking incidents, financial loss and impact to Key Performance Indicators (KPIs) to specific weather drivers.
    - Organisations are seeking **standardised**, **practical methodologies for building in financial cost considerations,** that can be applied by organisations at different levels of maturity and provide visibility at a city-wide level.
      - Participants emphasised the importance of **embedding** climate costings into **existing organisational processes**, rather than creating new, parallel systems.

The Guide provides…	**The Guide does not provide…**
A simple, consistent means of assessing the financial aspect (i.e. cashable savings/financial case) of climate risk and adaptation, accessible to all non climate specialists, and organisations and communities of varying resources and capabilities. This Guide will help improve collaboration and understanding of interdependencies.	Another general approach or methodology for organisations' climate risk and adaptation – there are plenty of existing guidance documents that cover this (e.g. Climate-ADAPT Adaptation Support Tool). This Guide is limited to financial considerations and does not provide advice on wider economic appraisal (e.g. benefit estimation, discounting, or financial sensitivity analysis).

The Climate Costings Framework

This guide offers a practical, six-step process to help organisations:



Organisations do not have to start at Step 1. For example, Step 5 might provide a more practical entry point if you are already taking weather and climate adaptation action.

This guide helps to bridge existing organisations' processes rather than replacing them:

Climate Risk Assessments (CRA)

CRAs help organisations understand vulnerability and likely future hazards. Climate costings build on this by translating those risks into **monetised impacts**, enabling organisations to prioritise hazards not only by severity but also by **financial significance**.

Business Cases and Investment Appraisal

Many organisations already have established procedures for building business cases or justifying capital and operational investment. Climate costings provide **quantitative evidence** of avoided losses, cost-effectiveness, and payback periods for adaptation measures. This ensures adaptation be evaluated **fairly** with other organisational priorities. **Green Book Supplementary guidance: climate change and environmental valuation** provides further guidance on considering the impacts of climate change in policy appraisal.

Financial Planning and Asset Management Systems

Climate costings integrate with existing finance, asset, and programme management systems by enabling climate-related spend and benefits to be **tracked**, **tagged** and **reported** consistently.

Organisations **do not** need to have completed a climate risk assessment, business case, or any other formal climate-related process before using this framework. It is designed to be **accessible** regardless of an organisation's starting point.

At the same time, organisations that *have* already completed climate risk assessments, developed adaptation strategies, or embedded climate considerations into their business case processes will **still find the framework highly valuable**. This guide offer a **distinct**, **financial lens** that **complements** these activities.

The Climate Costings Framework

Each step is broken down into the following sub-steps. Detailed practical guidance for each sub-step is outlined through the content of the Guide.

1 Understand how weather and climate change currently affect your finances

1a. Understand your existing data on impacts and engage with stakeholders
1b. Identify climate related hazards and their impacts
1c. Understand the current cost impacts of weather/climate change

2 Estimate how future climate scenarios impact your future finances

2a. Identify the uplift variables for each climate hazard and impact
2b. Apply climate uplifts to the current costs to determine the future impact of climate change

3 Identify a range of possible adaptation measures

3a. Develop a long list of actions
3b. Shortlist actions through a Multi-Criteria Analysis

4 Assess and select the most cost-effective adaptation actions

4a. Estimate the cost of implementing each short-listed action
4b. Estimate the avoided cost
4c. Identify the most cost-effective actions for implementation

5 Track the cost-effectiveness of implementing weather and climate change adaptation measures

5a. Integrate adaptation costs into existing management systems
5b. Tag cost entries with relevant information

6 Monitor, evaluate, learn and embed the benefits of implementing these measures into future decision-making

6a. Define 'extent of success' metrics
6b. Calculate financial outcomes
6c. Measure residual risk
6d. Evaluate outcomes
6e. Set up a financial monitoring plan

Embed a cycle of monitoring, evaluation and learning to continually improve the process.

Don't let perfection be the enemy of the good!
While you work through these steps, focus on developing high-level, workable estimates rather than chasing precision. The more you repeat this process, the more accurate your assumptions and data inputs will become. If this is your organisation's first attempt at this kind of exercise, begin small and keep the analysis proportionate. What matters most is getting started so learning can compound!

We need all organisations: a Climate Costs Guide for all, no matter your starting point

This guide is designed to be accessible to all London organisations, recognising that experience, data, and processes for climate risk and adaptation vary widely – especially when it comes to finances.

Considering your organisation's maturity helps you apply the six steps in a way that is realistic, proportionate, and able to evolve as systems and datasets improve.

London's resilience relies on every organisation contributing, whatever their starting point.

Maturity is a measure of process consistency. Smaller or earlier-stage organisations may be 'emerging' because of scale or resources, not commitment.

Larger organisations may appear more mature simply because they already have established systems.

Even mature organisations should expect to refine assumptions, respond to new risks, and strengthen their financial analysis over time.

Organisations can have independent maturity levels for each step of the Framework. For example, you might have strong risk assessment processes but limited financial tagging or MEL systems.

The table is intended as a guide, not a strict classification.

	Emerging Practice	Developing Practice	Embedded Practice
Typical Profile	Smaller organisations, teams with limited resources, or organisations beginning to explore climate risk and adaptation.	Medium-sized organisations; larger organisations that have some climate processes in place but not yet embedded, or teams with dedicated but limited climate capacity.	Large or highly mature organisations with established ownership of adaptation, analytical capabilities and long-term resilience programmes.
Feature	• Mixed awareness that weather and climate impacts are affecting their operations, assets, or finances. • Evidence and data may be fragmented or anecdotal. • Adaptation happens informally rather than strategically. • No organisation-wide climate risk assessment or adaptation strategy in place. • Ownership of adaptation may be limited or emerging. • Financial impacts of weather are not routinely quantified.	• Clear organisational recognition of climate-related risks and growing internal momentum. • Climate risk assessments completed for specific assets, though not yet organisation-wide. • A climate adaptation strategy or plan may exist, but implementation is uneven. • Data systems are improving, with some ability to link incidents, KPIs, or costs to weather events.	• Climate change adaptation is a core organisational priority, supported by senior leadership. • Organisation-wide climate risk assessments are conducted and routinely updated. • Climate risk and adaptation are fully integrated into investment appraisal, asset management cycles and organisational policies. • Robust data systems that enable consistent tracking of climate-related incidents, performance impacts, costs and benefits.
What climate costing looks like at this level	• Starting with simple data sources. • Focusing on a few priority hazards that are already causing disruption.	• Quantifying costs across multiple weather hazards with increasing confidence. • Working with asset, finance and data teams to improve processes and fill evidence gaps. • Moving towards routine tagging of climate-related spend.	• Detailed, high-confidence climate costings that support strategic planning, long-term budgeting, and portfolio risk management. • Comprehensive tracking of adaptation expenditure and quantified benefits. • Use of climate costings to challenge existing practices, drive innovation, and influence supply chains and partners. • Continuous improvement enabled by strong Monitoring, Evaluation and Learning (MEL) processes.

Key roles

To embed climate risk and adaptation successfully across your organisation, a wide range of functions need to be involved. The table below indicates some of the potential key functions we would expect the be involved at different steps of the Framework. **Please note that these will vary by organisation.**

Everyone is responsible for collecting their own data and sharing lessons learnt. Decisions can then be made collectively at Step 6.

Collaboration between organisations is also vital	1 **Understand how weather and climate change currently affect your finances**	2 **Estimate how future climate scenarios impact your future finances**	3 **Identify a range of possible adaptation measures**	4 **Assess and select the most cost-effective adaptation actions**	5 **Track the cost-effectiveness of implementing weather and climate change adaptation measures**	6 **Monitor, evaluate, learn and embed the benefits of implementing these measures into future decision-making**
Assets, operations and technical specialisms						
Operational delivery and facilities management	C	C	C	C	R	R I
Capital planning and delivery	C	C	R	C	R	R I
Asset ownership and lifecycle management	C	C	R	C	R	R I
Engineering and design	C	C	C	C	R	R I
Value and performance						
Performance, benefits, data and reporting	R	R	C	R	R	R I
Financial and cost management	R	R	C	R	R	R I
Enterprise risk management	R	C	C	C	R	R I
Climate and sustainability						
Climate and sustainability integration	C	C	R	R	R	R I
Governance, leadership and oversight						
Executive leadership, sponsorship and strategy	A	A	A	A	A	A

R **Responsible** A **Accountable** C **Consulted** I **Informed**

Before you begin: key climate change concepts

What is climate change?

Climate change refers to **long term shifts** in average weather patterns, including changes in temperature, rainfall, storms, droughts and other extremes. These changes are primarily driven by **human caused greenhouse gas emissions**. Understanding climate change is the foundation for estimating climate risks, costs and the value of adaptation.

What is climate risk?

Climate risk describes the potential for climate related hazards to cause harm. It is shaped by three components:

Hazard X **Exposure** X **Vulnerability**

The weather or climate event | *What is in danger (people, buildings, operations etc)* | *How sensitive these are to climate impacts*

London is already experiencing multiple climate risks, including:

- **Heatwaves (outdoor and indoor):** Increasing frequency and severity, affecting transport, health, visitor numbers and energy use.
- **Flooding:** River, surface water and groundwater flooding threaten homes, transport networks, cultural institutions and businesses.
- **Storms:** High winds and intense rainfall causing asset damage, service disruption and emergency response costs.
- **Drought:** Pressure on water supply, parks, urban greening and essential services.

What a climate cost?

This Guide refers to **climate cost** to mean any **financial impact** caused by weather or climate – this can be reactive or proactive spend. Some examples:

- Loss of revenue (e.g. reduced visitor or traveller numbers during heatwaves)
- Spend associated with repairing buildings, equipment, or infrastructure from an extreme weather event
- Increased maintenance or response costs
- Proactive climate adaptation spend (e.g. SuDS)

Climate costs provide a **tangible** way for organisations to understand how climate change affects them in a way easily communicable to senior leadership.

What are climate scenarios?

Climate scenarios describe different potential futures based on global greenhouse gas emissions. They help organisations understand how the climate may change and what risks may worsen. Common examples include:

- **1.5°C scenario:** A world where warming is limited to no more than 1.5°C above pre-industrial levels. Even at this level, London faces significantly hotter summers and heavier rainfall.
- **RCP4.5 (Relative Concentration Pathway 4.5)**: A 'moderate emissions' scenario where global emissions peak by 2045 and then decline.
- **RCP8.5:** A 'high emissions' scenario with continued global emission growth, resulting in more extreme climate impacts.

What is an uplift?

An **uplift** is the estimated increase in a climate hazard or impact over time, based on future climate projections. Uplifts help organisations understand how today's climate related costs may grow in future conditions.

What is a climate model?

A **climate model** helps to project how weather patterns will change over time. They help organisations understand how hazards may increase, select appropriate uplift factors and compare climate scenarios. Models do not predict exact outcomes but provide evidence-based projections.

What is climate adaptation?

Climate adaptation refers to actions that help organisations prepare for, manage, or reduce the negative impacts of climate change.
For example:

- **Engineered measures:** Shading, flood defences, insulation, ventilation or air conditioning upgrades.
- **Nature based solutions:** Trees, green roofs, SuDS.
- **Operational changes:** Adjusting opening hours, emergency plans, maintenance schedules.
- **Policy and governance measures:** Embedding climate resilience into strategies, procurement and investment decisions.
- **Digital/data measures:** Enhanced monitoring.

Step 1. Understand how weather and climate change currently affect your finances

Linking the cost of climate-related damage and disruption to your organisation's KPIs creates a strong evidence base for decision-makers. This builds confidence in adaptation and supports investment decisions.

This foundation also enables you to estimate future financial impacts and identify the actions needed to adapt. Insights from monitoring, evaluation and learning will help refine and improve the analysis over time.

Step 1 Checklist

- ✓ Engage with key stakeholders within your organisation (1a)
- ✓ Gather data and capture tacit knowledge from experts to support costings analysis (1a)
- ✓ Create a list of climate related hazards and their impacts (1b)
- ✓ Categorise climate related hazards and their impacts against KPIs (1b)
- ✓ Calculate estimated costs against each climate related risk and impact with documentation of calculations, limitations and gaps (1c)

Who in your organisation could be involved:

- **Roles with access to incident logs** e.g. asset managers, health & safety manager; operations/facilities managers; customer service managers; compliance
- **Roles with access to daily revenue** e.g. finance managers; operations managers; performance managers
- **Data and reporting analysts**
- **Senior decision makers who track organisational objectives** e.g. CFOs, shareholders, directors

1a. Understand your existing data on impacts and engage with stakeholders

To understand the cost of climate related hazards and impacts, it is important to start with good groundwork to ensure that the analysis provides meaningful insight and prompts action. Additionally, this is a good time to get wider buy-in, by meeting with relevant teams from across your organisation. This will provide a fuller picture of how climate impacts are felt today as well as support future adaptation efforts.

Below are some activities that would help you prepare for the next steps:

- Engage with decision makers to assess effectiveness of current KPIs to be able to measure impact of climate change and effectiveness of adaptations when implemented.
- Map out existing data sources from systems and understand what analysis is feasible.
- Consult experts to capture their lived experiences and knowledge and gather additional data sources to support the evidence base.

Using climate risk assessments:
Climate risk assessments could be completed at this stage to provide information on vulnerability to weather hazards. **This is considered best practice but is not an essential requirement.**

The following links provide guidance on completing a climate risk assessment:

- ISO14091 – Adaptation to climate change: Guidelines on vulnerability, impacts and risk assessment
- Department for Transport: Climate Risk Assessment Guidance for the Transport Sector

Starting with a baseline understanding from existing evidence or tacit knowledge is a minimum requirement to identifying relationships between climate related risks and their adverse impacts to your organisation in the next sub-step. In any case, it is important that all evidence/assumptions are sufficiently documented so that calculations can be revisited at a later point.

Step 1. Understand how weather and climate change currently affect your finances

1b. Identify climate related hazards and their impacts

Pairing up climate related hazards and their impacts helps to understand the full scope of how weather affects your infrastructure and operations. For example, a museum might identify heatwaves as a climate related risk and the impacts could be reduced revenue from closure and repairs required to restore heat-damaged artefacts. A single climate related hazard could have multiple impacts, and the relationships can be complex.

You can identify trends by reviewing existing reporting systems, exploring climate datasets and carrying out activities such as:

- Investigating the correlations between weather conditions and KPIs.
- Examining past incidents from major weather events (e.g. floods, storms, heatwaves) and their impacts.
- Reviewing when emergency weather plans were triggered and what impacts followed.

Expert knowledge from people who understand day-to-day operations is just as important as numerical data.

By the end of this sub-step, you should have a list of climate risks and their associated impacts. These should be mapped to relevant KPIs to support organisation-wide discussion, including with leadership. This work can also highlight opportunities to better integrate climate considerations into existing systems and decision-making.

Caution: Correlation does not imply causation. Weather hazards identified may not be a significant factor to the impact you have identified despite what your data may suggest. It is important that your analysis can be explained through reasoning based on expert knowledge.

ISO14090 – Adaptation to Climate Change: Section 6 lists potential examples of hazards and impacts that you could use to create your list. Ensure that these are tailored for your purposes. Information gathered here could also inform your Task-Force for Climate-Related Financial Disclosure (TCFD) submission, particularly under the 'Strategy' disclosures.

The Severe Weather Impact Monitoring System (SWIMS) developed by Kent County Council and adopted by various local authorities is a database used to record this information. This is an example of how impacts can be documented and may help you to use or adapt your own existing incident recording systems more effectively.

Examples of datasets you can use to help indicate potential weather hazards/impacts

Public sources:

- Flooding: Environment Agency Flood Maps
- Subsidence: Geobear UK Subsidence Map & Postcode Checker
- Heat: Major Summer Heat Spots using Landsat-8 Thermal Satellite data

In-house data:

- Service impacts e.g. ticket revenue; visitor numbers
- Asset failures
- Maintenance records
- Records of past incidents of adverse weather/events

You could also seek external support from similar organisations or consultants.

Step 1. Understand how weather and climate change currently affect your finances

1c. Understand the current cost impacts of weather/climate change

Each climate hazard and impact identified could have a cost per event/average cost within a particular timeframe e.g. cost per year, with documented calculations, assumptions, limitations and gaps. See the template on the next page for how this can be recorded.

Here are three ways to attribute impact costs to a weather hazard:

- **Direct attribution:** Costs and events may have already been tagged to a specific weather hazard already minimising the need for data analysis.
- **Statistical attribution:** Analysis of weather events/weather forecasts to specific impacts to infrastructure and operations and their costs.
- **Proportional attribution:** Using tacit knowledge from experts, a proportion of events could be attributed to weather where a total cost is available for an event type e.g. At a museum, an estimated 20% of artefacts that need to be restored are related to damage from extreme heat according to conservators. This proportion is applied to the total spent on restorations in a year.

The methodology you use to calculate the cost will depends on the quality and reporting of the datasets you use. Higher and lower bounds of your estimates can be used to account for uncertainty. This exercise in gathering and estimating cost impacts could help to identify current gaps in data to improve reporting.

Inflation:
When analysing costs from the past, it is important to take account of how costs have changed over time as a result of inflation. As a principle, all costs should be calculated using the current year you complete the analysis as a base.

Data limitations:
Lack of data could hinder the accuracy of cost estimates. Uncertainties in data should be recorded so that estimates can be improved on later. Alternatively, a wealth of tacit knowledge can be gained from engagement with technical experts e.g. change in risks according to weather.

Continuous improvement in recording data:
Many organisations do not yet have dedicated fields to record weather or climate-related impacts, which makes it difficult to estimate associated costs. Limited access to key datasets further restricts the ability to build a comprehensive evidence base. As a result, internal reporting will need to be improved. Where weather-specific fields are absent, free-text fields can be tagged using an agreed set of weather codes or keywords. AI tools could also be used to efficiently review and filter if there are large volumes of descriptive text.

In the long-term, upgrading/extending or adapting existing systems, or introducing new systems, to collect data could be a solution to enable for better quality analysis but this is difficult to implement and requires training.

Step 1. Understand how weather and climate change currently affect your finances

Example template:
The below shows an example of the costings analysis for a museum linking climate hazard and impact pairs to at risk KPIs with their associated costs per year. **Please note that estimated costs are not representative and are used for illustrative purposes only.**

				Current estimated cost per year		
At risk KPIs	**Climate hazard**	**Impact**	**Source, calculations and limitations**	**Best estimate**	**Min. estimate**	**Max. estimate**
Revenue from ticket sales	**Heatwaves**	Museum is closed as it is deemed too unsafe for visitors. Loss of revenue from no ticket sales due to closure.	**Museum revenue records:** Average ticket sales per day multiplied by total number of hot days across a five-year period. Min. and max. is the most and least ticket sales in a day the museum has had in the same five-year period.	**£20,000**	**£15,000**	**£25,000**
	Heavy rain and flooding	Museum floods and closed for visitors. Loss of revenue from no ticket sales due to closure.	**Museum revenue records:** Average ticket sales per day multiplied by total number of heavy rain/flood days across a five-year period. Min. and max. is the most and least ticket sales in a day the museum has had in the same five-year period.	**£10,000**	**£8,000**	**£12,000**
Cost of maintenance	**Heatwaves**	Artefacts in the exhibit become damaged due to the extreme heat. Repairs are required to restore artefacts.	**Arbitrary estimate based on tacit knowledge from restorers:** An estimated 20% of artefacts that need to be restored are related to damage from extreme heat. This is applied to total cost spent on restoration. Min. and max. determined by uncertainty of estimate.	**£50,000**	**£45,000**	**£55,000**
	…					

Step 2. Estimate how future climate scenarios impact your future finances

By applying future climate uplifts to your costs estimated from Step 1, you can approximate the potential future cost of climate change under a chosen climate scenario. Many different factors will influence the cost; this is an initial estimate that can be refined over time.

This will support analysis of the cost-effectiveness implementing adaptation measures based on the future impacts mitigated.

Step 2 Checklist

- ✓ Research climate indicators and capture knowledge from experts of how risks change based on weather (2a)
- ✓ For each climate hazards and impact, select the appropriate climate uplift and document justifications (2a)
- ✓ Select the future years you would like to model cost impacts (2a)
- ✓ Apply climate uplifts to current estimated costs to output future cost impacts (2b)

Who in your organisation could be involved:

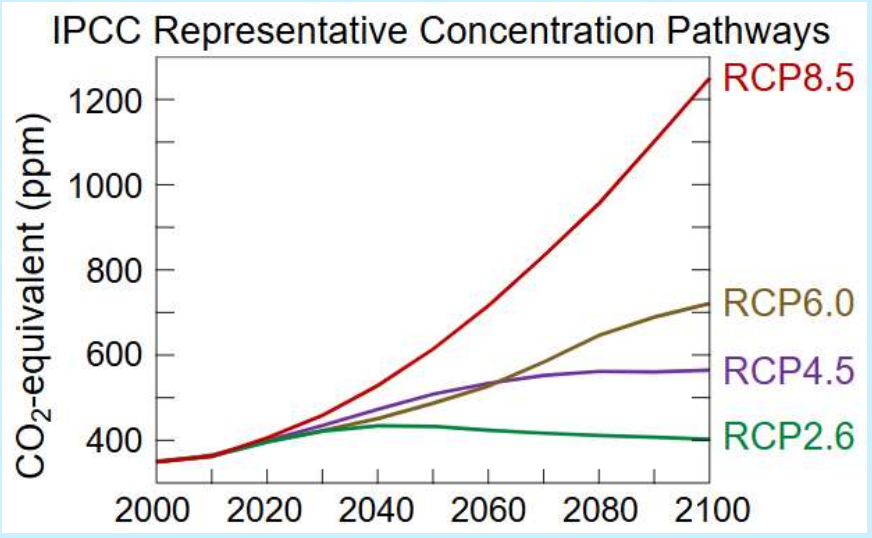
- **Data and reporting analysts:** Complete the calculations and data manipulation needed to apply the climate uplifts to the current estimated costs.
- **Climate and sustainability teams:** Consulted on which climate models are most appropriate to use.

2a. Identify the uplift variables for each climate hazard and impact

It's important to carry out some preliminary research to select the most appropriate climate uplift for each risk and impact, and to understand the limitations of the available data. This should draw on the tacit knowledge of experts and any evidence showing how hazards increase as climate indicators change. Direct climate data may not always be available, so proxies may be needed. Future uplifts will likely use the most recent UK climate projections e.g. RCP8.5 and may consider multiple scenarios.

Based on the available climate indicators and their uplifts, the years of which future climate impacts are to be modelled will need to be selected. The future time period can be based on key milestones for your organisation.

The next page shows publicly available data models that you could use for your climate uplifts.



Step 2. Estimate how future climate scenarios impact your future finances

A number of climate models are available that you could use as climate uplifts. These provide future climate data at varying spatial and temporal levels:

Source	Description	
LCAT: Local Climate Adaptation Tool	A public tool that can be used to understand at a local authority level about how local climates will change, what health and community impacts may occur as a result, who will be most vulnerable and why and which adaptations could be considered.	
Environment Agency: Flood Maps	A map displaying the long-term flood risk; climate change impacts can be togged on/off.	
Met Office: Local Authority Climate Explorer	A public database containing climate averages and indicator data at the local authority scale, with metrics relevant to local authority activity. The climate indicator data may be more applicable than the climate average data if looking to understand the change in certain extreme temperature-related events.	
UK Climate Risk Indicators (UK-CRI)	A public database containing climate risk indicators using latest UK Climate Projections 2018 including rainfall and temperature extremes. This also contains specific indicators impacting health, transport and agriculture.12kmx12km grid square is the most appropriate spatial resolution – other resolutions include pre-calculated weightings.	
Tailored climate models	If required, climate modelling data or software can be purchased from suppliers to better tailor modelling for future costs. These models may be preferable analysis is required based on specific weather thresholds, a need for improved spatial or temporal resolution, or where weather and impact relationships are complex (e.g. water resources modelling).	

Most accessible

More advanced and tailored models

Step 2. Estimate how future climate scenarios impact your future finances

2b. Apply climate uplifts to the current costs to determine the future impact of climate change

Using the current cost estimates from Step 1, the next step is to apply the climate uplifts from 2a to determine the estimated future cost impacts of climate change.

If higher and lower bounds were calculated in the current cost estimates at Step 1, the same climate uplifts can be applied to determine the maximum and minimum estimates under the chosen future climate scenario(s) and time period(s).

All outputted costs should remain in current-year values for easy comparison.

Note that this is a simple approach that assumes cost impacts increase linearly.

Caution:

Future climate models illustrate **possible scenarios, not precise predictions.** Actual outcomes may differ, and the limitations of any model should be clearly documented.

Worked example:
Below shows how this step works in practice for a bus operator completing this analysis for one of the weather hazard/impacts pairing they had identified. In this case, they are modelling based on the RCP8.5 Climate Scenario for 2050. **Please note that estimated costs are not representative and are used for illustrative purposes only.**

2b Uplift applied to current estimated costs per year based on climate indicator used.

1 Current estimated cost per year for each weather hazard/impact pairing determined from Step 1.

		Current estimated cost per year			2050 estimated cost per year		
Climate hazard	Impact	Best estimate	Min. estimate	Max. estimate	Best estimate	Min. estimate	Max. estimate
Heatwaves	Bus vehicles breakdown in operation and repairs are required as a result.	£50,000	£40,000	£60,000	£89,000	£71,200	£106,800

2a Uplift variable identified for impact.

Climate indicator used and justification
Using UK-CRI data, the number of Met Office heatwaves in London is set to increase by +78% by taking the median value.

Step 3. Identify a range of possible adaptation measures

This step helps you structure your decision-making for identifying effective adaptation actions. It guides you in creating a long list of options and using a multi-criteria analysis (MCA) to shortlist the most suitable actions. This shortlist of actions should be taken into Step 4 for further analysis to determine the most cost-effective options.

Step 3 Checklist

✓	Identify a full range of potential adaptation measures informed by organisational climate hazards and impacts (3a)
✓	Engaged internal teams and external experts where relevant to collect data, insights and examples of best practice (3a)
✓	Create the Multi-Criteria Analysis Framework to apply to the longlist of actions
✓	Conduct Multi-Criteria Analysis to identify shortlisted options to take into further analysis in Step 4 (3b)

Who in your organisation could be involved:

- **Organisations and facilities managers**: Identify feasible adaptation actions, drawing on experience of asset performance, maintenance issues, and operational constraints.
- **Asset managers**: Help identify where adaptation actions can be integrated into existing asset strategies and programmes.
- **Finance and performance teams**: Advise on affordability, funding routes, and potential financial trade-offs of adaptation actions.
- **Climate and sustainability teams**: Help align the list of actions with climate risk assessments and relevant guidance.
- **HR**: Advise on policies that may need updating to reflect climate-related risks and ensure actions consider workforce wellbeing, capacity, and skills requirements.
- **Communications**: Develop clear messaging for staff and wider stakeholders to encourage buy-in and behaviour change.
- **Engineers**: Provide technical expertise to assess the feasibility, design requirements, and performance implications of proposed adaptation actions.

3a. Develop a long list of actions

There are a wide range of potential actions that can address the weather- and climate-related hazards from Steps 1 and 2. The process in understanding which adaptation actions are most appropriate requires engagement with internal teams and external adaptation/resilience experts. In practice, a combination of actions is likely to be most effective, selected for site or organisation-specific requirements.

Organisations have a wide range of potential adaptation actions to consider including:

- **Engineered actions** to assets (e.g. building retrofit, installing blinds).
- **Nature-based actions** that provide wider benefits beyond mitigating climate impacts.
- **Behavioural/operational actions** to embed risk mitigation into day-to-day planning (e.g. changing work schedules, unplugging laptops).
- **Policy and legal based actions** to update strategies to reflect risk.
- **Research based actions** to reduce uncertainty and improve future decision-making.

From the hazards identified in Step 1, organisations may already have measures in place that address climate risks, even if they are not labelled as ‘adaptation’. Identifying these actions and reflecting on what has worked well and what could be improved provides a strong starting point for developing a long list. Involving stakeholders across the organisation helps build shared ownership, early buy-in, and ensures actions reflect both organisational needs and operational realities.

Some adaptation actions may be outside the direct control of an individual organisation e.g. where outcomes depend on the resilience of wider systems such as transport, power, or communications networks. This highlights the importance of cross-organisational collaboration and coordinated approaches to adaptation.

Step 3. Identify a range of possible adaptation measures

Useful resources for drawing together the long list of adaptation actions:

Source	Description
Compendium of adaptation and resilience measures for schools, Greater London Authority	The compendium was created specifically for schools but can be applicable to a far wider range of buildings and outdoor areas (e.g. public realm). The actions are split into five categories: Sustainable Drainage Systems (SuDS); hard flood resilience; ventilation and cooling; solar shading; and water efficiency.
UK Adaptation Inventory, Open Climate Impact	A database of climate adaptation actions that have been undertaken by a range of organisations across the UK during the period 2010-2020, produced by Jenkins et al. (2022). Each action includes a short description and is tagged against the climate hazard and risk it addresses, and in what sector the action was applied.
Adaptation options, EU Climate ADAPT	A catalogue of climate adaptation options, with filtering available based on climate impact (hazard), sector and key measure type – these types cover five different categories: (A) policy, management and planning, (B) finance and insurance, (C) grey/engineered and technological adaptation, (D) blue-green infrastructure and (E) education, awareness raising and capacity building.
Overheating Adaptation Guide for Homes, Shade the UK	Shade the UK, commissioned by the Red Cross, has created this Guide providing 43 measures people can consider to mitigate against overheating including external shade, internal shade, passive cooling, ventilation, and minimising internal heat gains in homes.

Step 3. Identify a range of possible adaptation measures

3b. Shortlist actions through a Multi-Criteria Analysis

A Multi-Criteria Analysis (MCA) is a decision-support tool that enables comparison of different adaptation actions based on a set of predefined criteria. The criteria should be tailored to the stakeholders' needs, producing a score against the long list of solutions to justify the prioritisation of specific actions. The MCA can help to create a shortlist of possible actions which require further analysis.

The criteria used in the MCA should be tailored to your organisation. They can include:

- **Core climate risk reduction:** How effectively the action reduces overall adaptation risk by lowering hazard intensity, exposure, and/or vulnerability - aligned with the highest-risk hazards identified in Steps 1 and 2.
- **Co-benefits:** Additional benefits beyond adaptation, such as improvements to biodiversity, carbon, community outcomes or air quality.
- **Feasibility:** Whether the organisation has the governance, expertise, resources and technical capability to design and deliver the action.
- **Scalability:** How widely the action could be applied across assets or sites, and whether planning or operational constraints may limit implementation.
- **Implementation timeline:** How long the action will take to deliver and how this aligns with wider organisational priorities or deadlines.
- **Flexibility:** How the action can be adjusted or phased over time.

For lighter touch MCAs, scores for each criterion can be provided based on intuition, judgement, and light research. Practitioners can draw on expert insight, previous projects, or comparable case studies to assign scores and identify actions that are more or less favourable.

For more in-depth MCAs, thresholds can be identified to qualify for low, medium, or high scores, for instance, from -1 to 2. Thresholds are specific cut-off points that determine what score each option gets. For instance, to score the implementation timeline dimension, scores can be set at 0 for 5+ years, 1 for 2-5 years, and 2 for 0-2 years.

Some level of expert judgement will always be necessary. Different organisations or practitioners may have different interpretations based on their operational context or strategic priorities. What matters most is that the scoring process is consistent and aligned with organisational objectives.

Step 3. Identify a range of possible adaptation measures

3b. Shortlist actions through a Multi-Criteria Analysis

Example template for scoring actions

The tables show two options for scoring an example action of external shading that could be used to combat heat:

Lighter touch MCAs can simply tick whether criteria are met.

Action	Core risk reduction	Co-benefits	Feasibility	Scalability	Timeline	Flexibility
External shading	✓	✗	✓	✓	✓	✓

More in-depth MCAs can do more thorough research to score each criterion (e.g. from -1 to 2) depending on different criteria.

Action	Core risk reduction	Co-benefits	Feasibility	Scalability	Timeline	Flexibility
External shading	**1**	**0**	**2**	**1**	**2**	**1**

The Multi-Criteria Analysis can be used as an engagement tool

A workshop can be held at inception to shape the design of the MCA framework (MCAF). This workshop can influence: the criteria included in the MCAF; and the weighting of criteria, for instance if certain aspects should be weighted higher because they are of more importance to your organisation.

A workshop with relevant stakeholders should also be held once the MCA and scores have been provided to finalise and validate the shortlist.

Step 4 - Assess and select the most cost-effective adaptation actions

Once the short-listed actions have been identified they are ready to undergo further analysis. This step provides guidance on how to assess cost-effectiveness to identify which adaptation actions could be implemented.

Step 4 Checklist

- ✓ Calculate the total cost of implementing each short-listed actions (4a)
- ✓ Calculate the avoided cost of each short-listed action (4b)
- ✓ The payback period of each short-listed action (4c)
- ✓ The actions which will be implemented, considering the most cost-effective (4c)

Who in your organisation could be involved:

- **Organisations and facilities managers**: Help validate cost assumptions, identify practical constraints, and assess how actions may affect service delivery during their implementation and lifetime.
- **Asset managers**: Support estimation of capital and lifecycle costs by providing asset-specific information such as quantities, condition, remaining life, replacement cycles, and planned renewals.
- **Benefits realisation teams**: Support the articulation of benefits in a way that aligns with organisational benefits frameworks.
- **Finance and performance teams**: Support development of cost profiles, advise on financial appraisal methods (e.g. payback periods), and ensure actions can be compared with other investment priorities.
- **Climate and sustainability teams**: Input on the expected effectiveness of adaptation actions.
- **Data analysts**: Lead on developing and refining the cost calculations by bringing together datasets and ensuring assumptions are well-documented.

4a. Estimate the cost of implementing each short-listed action

Once a shortlist of adaptation actions has been developed, the next step is to estimate the cost of implementing each action.

Estimating cost involves determining the number of units of volume required to implement the action by considering:

- **The asset the action applies to** e.g. the number of windows which would require blinds to be installed to help reduce indoor temperatures.
- **The number of units affected by the climate impact using the outputs from Step 1 of where current issues are** e.g. if 10 air-conditioning units regularly fail during heatwaves, it could be determined whether all 10 need upgrading. Judgement-based assumptions can be made where necessary,
- **The number of units requiring adaptation in the future as climate impacts worsen**, **using the climate-related cost increases calculated in Step 2** e.g. if flooding-related maintenance is expected to rise by 50%, it could be assumed that 50% more staff resources are needed compared with today.

Unit costs can then be applied to this total to calculate the capital cost. Capital costs can be identified through research, previous projects, or comparable case studies. Where data gaps exist, higher and lower bounds could be calculated to provide a range of costs. **Any ongoing operational or maintenance costs can also be considered to calculate the total action cost.**

Total action cost = Capital cost + Operating cost + Maintenance cost

When assessing actions, it's important to balance affordability with cost-benefit analysis. Affordability looks at whether an organisation can realistically fund an action within current budgets and staffing capacity. Cost-benefit analysis, on the other hand, focuses on long-term value (e.g. over 40 years) to understand how much future loss, disruption, or damage an action could prevent.

Step 4 - Assess and select the most cost-effective adaptation actions

4b. Estimate the avoided cost

To understand whether an adaptation action is worth investing in, two scenarios can be compared: one where no action is implemented, called the 'do nothing', and one where an action is implemented. Step 2 provides this 'do nothing' scenario by showing how costs are expected to increase in the future due to climate change. This is the future cost an organisation could face if it chose not to adapt.

To recap, this was calculated in Step 2 as:

Future cost impact = **Baseline cost** × **Climate uplift**

To estimate the benefit of implementing an action, or the 'do something' scenario, the proportion of these future costs which could be avoided can be estimated.

Co-benefits
Some adaptation actions may generate additional benefits which might have been identified in Step 3 as co-benefits. These co-benefits could translate to further avoided costs. A percentage efficacy could also be estimated for these to calculate additional avoided costs.

Taking a broader, system-wide perspective on co-benefits can help reveal wider value. Considering co-benefits can open up opportunities to share costs or secure funding contributions from different funding sources both within different teams in your organisation and potentially externally, with other organisations or stakeholders.

Determining the effectiveness of the measure:

The first step is to estimate how effective each action will be in reducing climate-related costs, based on expert judgement or evidence. This can be estimated by assuming the action reduces a share of future costs that is proportionate to the projected climate uplift, calculated in Step 2, that the action is designed to address. For example, if climate projections indicate that a particular weather or climate-hazard is expected to increase by around 15%, an adaptation action that directly targets that risk could be assumed to avoid a similar proportion of the associated future costs. Where an action only addresses part of the overall cost (for example, reducing damage to specific assets but not wider service disruption), its estimated effectiveness should be adjusted accordingly using expert judgement and knowledge of operational or asset-level relationships.

A more detailed approach is to research the likely effectiveness as a percentage of each action by drawing on existing evidence. This could include published literature, past project evaluations, technical studies, supplier performance data, pilot trials, or benchmarking against comparable organisations to derive an evidence-based estimate.

Step 4 - Assess and select the most cost-effective adaptation actions

4b. Estimate the avoided cost

Calculating the avoided cost:

The avoided cost can then be calculated by multiplying the expected future "do nothing" costs by the estimated effectiveness of the action. This shows how much money the action could save.

Avoided cost = Climate-uplifted future costs × Effectiveness

To reduce uncertainties in climate projections and in the underlying cost data, a lower and upper estimate can be calculated. The lower bound could use the minimum baseline cost, while the upper bound could use the maximum projected cost for 2040. This promotes understanding of the full range of possible financial benefits, and recognises that even without severe climate change, some benefits may still arise from implementing the measure.

These figures should be treated with caution.
They are early estimates based on assumptions about future climate impacts, asset performance, and how well adaptation measures will work. As more data is collected and as real-world performance is monitored, these estimates will improve. Repeating the steps in this guide, refining methods, improving data quality, and working closely with teams will build a clearer and more confident view of the true financial value of adaptation over time.

4c. Identify the most cost-effective actions for implementation

Determining cost-effectiveness:

Once the avoided costs have been estimated, the next step is to understand whether each adaptation action is cost effective. This can be understood by comparing the action cost with the avoided cost the implemented action is expected to save over time. A simple way to do this is to calculate the payback period. This tells you how long it will take for the avoided costs to cover the upfront cost of the action. Based on this analysis, cost-effectiveness of actions can be assessed.

$$\text{Payback period} = \frac{\text{Capital costs}}{\text{Avoided costs} - (\text{Operating cost} + \text{Maintenance cost})}$$

Generally, if the payback period is shorter than the expected lifespan of the action, or if the measure costs less to run each year than the losses it prevents, it could be deemed cost-effective and could be implemented.

Important to keep in mind:

- Costs and benefits contain uncertainty. It is good practice to calculate both a lower-bound and upper-bound payback time using the minimum and maximum avoided-cost estimates.
- Climate uplifts in Step 2 were likely modelled to a specified time period. This means the avoided costs calculated are up until that year and in practice, if the climate continues to change beyond that time period and the action remains functional, avoided costs could continue to increase.

Step 4 - Assess and select the most cost-effective adaptation actions

4c. Identify the most cost-effective actions for implementation

Potential approaches to structuring the delivery of actions
Consideration should be given to how different actions could be paired or grouped together to see if it is appropriate to implement any actions which are not the most cost-effective and take a different approach, such as a 'build back better' approach.

- **Implementation and benefit realisation timelines:** Schemes with shorter payback periods should be prioritised to quickly establish resilience where losses are greatest.
- **Action synergies or dependencies:** Mapping adaptation actions to wider initiatives and programmes can be helpful as enablers of social and environmental outcomes.
- **Balanced resourcing:** Understanding any resource gaps for the identified responsible owners can inform where alternative funding mechanisms may be needed to enable action delivery.
- **Resource availability**: Identifying responsible owners and their resource capabilities compared to the resources required for delivery can be helpful in phasing delivery.

The opposite box shows potential categories for actions which can be used to frame thinking of potential synergies between actions, including those which are not deemed the most cost-effective.

Best value ≠ cost-effectiveness

Cost-effectiveness focuses mainly on achieving the lowest cost for a given level of output, but best value takes a broader view that balances cost with quality, outcomes, risk, sustainability, and other long-term benefits to consider the wider impact of a decision.

Given the focus on cost in this guide, this method does primarily focus on cost-effectiveness - this can then be a springboard to discuss how to weight the importance of non-cost based factors.

Categories which can be used to pair different climate adaptation actions:

Quick wins: Sustainable benefits are realised in the short term. They likely combine a relatively low cost of implementation with immediate impact for frequently occurring losses.

Enabler actions: A prerequisite action for other actions to be delivered, depending on their extent they can be implemented in the short to medium term.

Complementary actions: An action that complements transformative or enabler actions, or a wider existing programme already in place within the organisation.

Transformative actions: Sustainable benefits are realised in the long term. They are likely to benefit multiple stakeholders and go beyond mitigation to yield additional benefits. They tend to be capital intensive and require a longer implementation timeframe.

Step 5. Track the cost-effectiveness of implementing weather and climate change adaptation measures

Setting up a system to track and monitor the cost-effectiveness of adaptation measures helps you see whether they are delivering the anticipated value. It also strengthens your baseline data for future business cases and supports transparent reporting against requirements like Building Regulations Part O, local planning policies, and public sector obligations such as TCFD. At this stage, the aim is to track progress – detailed evaluation happens later in Step 6.

Step 5 Checklist

- ✓ Establish a dedicated adaptation code within existing systems (5a)
- ✓ Integrate adaptation costs into existing systems (5a)
- ✓ Create a clear tagging system(5b)

Who in your organisation could be involved:

- **Finance teams**: integrate adaptation spend into existing systems, set up budget codes, track CAPEX/OPEX, and support benefit tracking.
- **Asset / programme / project managers**: tag expenditure correctly, track delivery costs, and provide updates on project progress.
- **Operations / maintenance teams**: to record ongoing operational costs and identify efficiency gains or avoided costs.
- **Data and reporting analysts**: to maintain tagging systems, ensure data quality, and develop dashboards or reports.

Caution: Tracking adaptation-related spend is a developing area across all sectors. Most organisations are still building capability. Your first attempt may be high-level, but approaches will mature over time.

5a. Integrate adaptation costs into existing management systems

Rather than creating parallel processes, organisations should integrate adaptation spending into existing finance, asset, and programme management systems. Establishing a dedicated adaptation code enables consistent tracking of expenditure, for both CAPEX and OPEX, to provide a complete picture of adaptation investment.

CAPEX Examples	OPEX Examples
Costs of physical adaptation measures	Routine maintenance
Installation and construction costs	Monitoring equipment or sensor maintenance
Access equipment (e.g. scaffolding, specialist lifts)	Seasonal adjustments (e.g. increased ventilation)
Procurement-related costs such as tendering, feasibility studies, and professional fees	Software licences or subscriptions for monitoring performance

5b. Tag cost entries with relevant information

Organisations should add simple adaptation tagging fields to their workbanks and financial data so that costs can be readily filtered, grouped and analysed.

Tagging should be **quick** and **practical**, not burdensome. To keep workload light:

- Prioritise essential tags
- Use dropdown menus or pre-selected options
- Apply consistent wording across departments

Climate Driver
- What weather / climate factor is this spending linked to?
- *Heat, flooding, storms, drought…*

Risk Category
- Which KPI or KRI is affected?
- *Revenue risk, health and safety risk, service disruption risk…*

Asset/ Function Affected
- What is the adaptation measure protecting ?
- *Buildings, public realm, ICT systems…*

Step 6. Monitor, evaluate, learn and embed the benefits of implementing these measures into future decision-making

Monitoring, Evaluation and Learning (MEL) helps you check whether adaptation measures are delivering expected value. This evidence strengthens future business cases and supports better-informed investment decisions. Process feedback can also improve earlier stages of the framework and drive continuous improvement.

Step 6 Checklist

- ✓ Define success metrics and rating (6a)
- ✓ Calculate financial outcomes (6b)
- ✓ Measure residual risk (6c)
- ✓ Evaluate outcomes (6d)
- ✓ Set up a monitoring plan (6e)

Monitoring works best when it is built into adaptation actions from the **very start of implementation**. It should naturally **feed into each stage of the framework**, helping organisations to gather evidence, refine assumptions and strengthen decision-making over time.

Caution: Structured adaptation monitoring is new for most organisations, and fully developed systems are still rare. Your first iteration may be high level, but the process will naturally become more detailed and robust as experience and capability grow.

Who in your organisation could be involved:

- **Finance / asset teams:** To provide Step 5 data.
- **Data and reporting analysts:** To gather and analyse MEL datasets.
- **Strategy leads:** To coordinate the MEL process, define success metrics, identify lessons learnt and feed back into Steps 1-5 and to leadership / project teams.
- **Leadership:** To review findings, endorse changes to processes and integrate lessons into future planning and investment decisions.

6a: Define 'extent of success' metrics

Success metrics can capture:

Degree of financial effectiveness: e.g. % reduction in disruption costs, actual savings vs expected savings

Extent of risk reduction: e.g. how far incident frequency, repair costs or revenue loss have deceased

Performance vs forecast: e.g. better, worse or in line with expectations

Value for money: e.g. updated payback period, updated cost-benefit ratio

Stakeholder feedback: e.g. staff productivity or user feedback, related to monetary values

Future justification: would you re-invest in this measure based on performance?

It may be helpful to define clear rating bands to measure the extent of success, e.g. lower, middle and upper performance limits. These metrics allow you to judge how well the measure performed and makes comparison across different measures easier.

6b: Calculate financial outcomes

Organisations should compare observed outcomes with baseline financial costs (Step 1), predicted financial benefits (Step 4) and tracked expenditure and tracked benefits (Step 5).

Analysis should quantify:

Realised avoided losses

Realised cost savings

Net financial benefit

Step 6. Monitor, evaluate, learn and embed the benefits of implementing these measures into future decision-making

Disclaimer: Within this framework, there is a focus on financial metrics to assess outcomes. However, qualitative information may be helpful to explain quantitative results – e.g. if higher ticket sales are supported by customer feedback showing improved comfort.

6c. Measure residual risk

Residual risk is assessed by determining how much climate-related risk remains after the adaptation measures have been put in place. Doing so helps ensure that adaptation efforts do not stop too soon and shows where additional investment or action may still be required.

Remember that residual risk does not equal failure! Some risk will remain – the aim is to make it manageable and transparent.

6d. Evaluate outcomes

Using the financial outcomes from Step 6b and the residual risk identified in Step 6c, assess how well the adaptation measures performed against the success metrics set out in Step 6a. This includes determining where performance met, exceeded, or fell short of expectations. Where results differ from what was forecast, provide a clear explanation for the variance.

Caution: It can be difficult to judge the success of adaptation with short term metrics, since the weather event a measure is designed to address may not occur for some time. This means early results seem limited, and continued monitoring is needed to build a clearer picture of effectiveness over multiple seasons and hazard cycles.

Was the hazard **less** or **more severe** than anticipated?

Did **external factors** influence results (e.g., staffing, use patterns, service levels)?

Were implementation, operating or maintenance **costs higher** or **lower** than expected?

6e. Set up a financial monitoring plan

Where possible, organisations should rely on existing systems to manage data collection and monitoring:

Finance systems (for OPEX and CAPEX)	**Incident recording systems**	**Asset management databases**
Revenue / performance dashboards	**Energy or utility billing systems**	**Project financial codes (Step 5)**

Identify the datasets you need, who owns them, and any gaps to address. Set a practical schedule for collecting data (e.g., monthly, seasonal or annual), depending on when impacts are most visible or when reporting cycles occur. Clearly assign responsibility for collecting, checking and reporting the data, and for who will use it. This structured approach ensures consistent tracking over time and supports better decision-making and future adaptation planning

Adaptation pathways thinking can support this step, enabling you to link monitoring results to clear decision points or trigger thresholds that demonstrate additional or alternative actions are needed.

Tools to help create an adaptation pathway can be found in the RAPA toolkit.

Embed a cycle of monitoring, evaluation and learning to continually improve the process

This process evaluation considers how Steps 1-6 were delivered and what could be learned from in subsequent iterations of this process.

Document lessons learnt

Record lessons by noting what worked well and what did not. Gather insights from staff, contractors, users, and any other relevant stakeholders to form a well-rounded understanding of performance. Use structured templates for documenting these reflections so that lessons can be compared consistently across different projects.

Data and Evidence	• Did you have the data you needed? • Were there data gaps or inconsistencies? • Were tagging processes clear and accurate?
Implementation	• Did costs differ from forecasts? Why? • Did procurement, contractor, or operational issues affect delivery?
Cross-Team Coordination	• Was collaboration between teams effective? • Were roles, responsibilities and expectations clear?
Decision-Making	• Were decision processes clear and timely? • Were approvals easy to navigate?
Improvements	• What should we change next time • What key lessons should be shared with leadership and project teams

Feedback into organisational processes

Share findings with leadership and delivery teams so lessons are understood across the organisation.

These insights should inform updates to adaptation guidance, templates, operational plans, and monitoring systems, including KPIs, reporting and underlying data.

Applying this learning strengthens future investment decisions and builds internal confidence in the value of adaptation. Organisations should also define how often feedback is collected and reported, and who is responsible for acting on it.

Caution: This is not about highlighting failures. It is equally important to capture what is working well. Positively framing success helps build internal confidence and strengthens future business cases

How does this feed into other steps?

- **Step 1:** Provides better data on climate-related disruptions and performance
- **Step 2:** Offers updated evidence on sensitivities and vulnerability to climate drivers.
- **Step 3:** Highlights which risks remain high and where further action is needed
- **Step 4:** Supplies real-world evidence to improve assumptions and refine payback calculations.
- **Step 5:** Enhances the quality and utility of financial data for evaluating performance

Your organisation may **already be collecting information** relevant to this step:

- Health and safety / incident reporting systems
- Finance / asset management systems with expenditure tracking
- Performance management systems
- Energy monitoring and building management systems
- Customer satisfaction surveys or user feedback channels
- TCFD, ISO 14090 or sustainability reporting processes

Case studies

The following case studies provide real-life examples of how organisations have implemented some/part of the framework steps. Please note that the existing case studies do not fully cover all steps of the framework. **We would appreciate further case studies that highlight lessons learned, including what has worked well and what has not when using the framework.**

Case Study	Quick description	Relevant steps of the Climate Costs framework
1. Network Rail Scotland Region – Climate Adaptation Costings	Comprehensive assessment of cost impacts and adaptation measures on assets managed across Network Rail.	**1** **2** **3** **4** 5 6
2. Transport for London (TfL) London Underground – Quantifying the impacts of heat and climate change	An in-depth study into the impacts of heat and climate change on TfL's underground network.	**1** **2** **3** 4 5 6
3. Guy's and St Thomas' Hospital IT Incident – Quantifying impacts of the July 2022 Heatwave	Documentation of the impacts of a heatwave to a hospital's IT network.	**1** 2 3 4 5 6
4. Hammersmith and Fulham Council – Water butts project	Implementation of water butts across Hammersmith and Fulham based on the findings of the council's climate risk assessment.	**1** 2 **3** 4 **5** **6**
5. Mayor of London - Climate budgets	Tracking and transparency of climate adaptation measures against resilience and net-zero targets.	1 2 3 4 **5** **6**
6. City of Edinburgh Council – Analysis of costs of climate impacts and adaptation actions	A review of costs/damages related to major climate change impacts and the costs and benefits of key adaptation measures across Edinburgh.	**1** **2** **3** **4** 5 6

The members of the LCRP have shared as many case studies as could be collected from a large representative cohort of most of London's business. It is a helpful indicator to demonstrate how adaptation-ready London is. We can see multiple case studies for Step 1 for example, showing that uptake is high and relatively mature compared with the other steps.

1. Network Rail Scotland Region – Climate Adaptation Costings

Organisation: Network Rail Scotland Region **Year:** 2025

As part of Network Rail's wider Climate Adaptation Pathway's programme, Arup was commissioned by the Scotland Region to provide an estimated present-day cost to the railway and possible future trajectories from weather hazards and climate-related hazards for an adapted vs un-adapted railway.

To calculate how climate change was impacting the region, train delays, maintenance work, renewals events and their costs were attributed to weather hazards. This integrated various datasets across Network Rail's operational functions, engagement with engineering disciplines and data analysis from past weather events. Climate uplifts were applied from various sources including SEPA Flood Maps, UKCRI data and off-the-shelf climate models to calculate the estimated cost impacts of weather from 2030 and beyond. Cost estimates were able to be segmented by spatial resolution, cost type (e.g. whether it is relevant to train delays, maintenance etc.), asset type, and weather hazard, enabling multiple perspectives and supporting communication across different teams.

Adaptation measures were costed and applied to the most significant hazard-asset pairings to minimise the calculated future impacts, forming a foundation for cost-benefit analysis and payback period of resilience schemes and programme.

Relevant Climate Costs Framework step(s):

1 2 3 4 5 6

What internal teams/roles were involved?

- Weather Resilience and Climate Adaptation team
- Asset engineers across various disciplines
- Consultants specialising in asset management, resilience, engineering and climate sciences

Lessons learnt and next steps

Based on the analysis and findings of the assessment, follow-up recommendations were made including to:

- Enhance reporting to better attribute impacts (such as weather tagging) to provide a stronger evidence base of cost impacts from climate change.
- Validate and refine assumptions made in the costing assessments with asset teams, improving confidence in the cost estimates.
- Communicate internally to establish a shared understanding across the Region to inform future adaptation strategies/priorities.

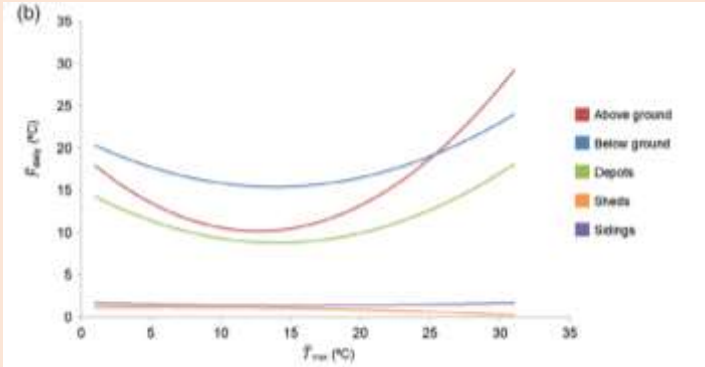
2. Transport for London (TfL) London Underground – Quantifying the impacts of heat and climate change

Organisation: TfL/University of Birmingham **Year:** 2019-2023

'Quantifying the impacts of heat and climate on the London Underground' investigates how increasing temperatures (current and future) affect the performance and resilience of the London Underground. As opposed to cost, the study predominantly assesses the relationship between risk and asset performance but could be a valuable input to an assessment on cost, if delays were then associated with cost information.

This was completed by reviewing the present-day and projected future climate context of London and temperature variations across the network. Based on a subset of assets, the impact of temperature on faults is quantified using a fault-rate approach. The study explored the heat impacts with respect to failures, asset performance, reactive and corrective maintenance as well as worker's wellbeing on the network on surface, sub-surface and deep tube tunnels.

Results from this study were discussed in the context of existing heat management measures and future climate change risks and planning for adaptation.



The relationship between daily maximum temperature and mean daily frequency of delays at different London Underground assets.

Relevant Climate Costs Framework step(s):

1 2 3 4 5 6

What internal teams/roles were involved?

- Transport for London – Climate adaptation team
- University of Birmingham

Lessons learnt and next steps

Based on the analysis completed in the paper, a number of strategic recommendations were provided to TfL:

- Adapt infrastructure and maintenance strategies for heat by considering preventative maintenance at lower temperatures and earlier seasonal intervention.
- Improve data quality and asset intelligence through enhancing asset management systems to better capture weather and temperature attribution facilitated by engineers, climate analysts and key decision-makers within TfL as well as experts externally.

3. Guy's and St Thomas' Hospital IT Incident – Quantifying impacts of the July 2022 Heatwave

Organisation:	NHS Guys and St Thomas' Hospital	Year:	2022

Hot weather forecast of 40°C was identified on 15th July, triggering agreement of Hot Weather Plan roles and responsibilities, including condenser hosing at St Thomas'. Following extreme temperatures, a controlled shutdown of the data network was undertaken after damage occurred. The Trust moved to "Paper Hospital" operations due to loss of clinical IT across Guy's, St Thomas' and Evelina. Impacts of the heatwave and weather recordings were documented.

Key recordings/data sources:
- Temperature and humidity readings (ambient temperatures up to 40°C).
- Data centre environmental monitoring (server room temperatures exceeding 50°C at Guy's; compressor trip at 36°C at St Thomas').
- IT asset information (two data servers, 371 legacy IT systems, cooling system specifications).

Heatwave resulted in:
- Failure of air conditioning and cooling systems.
- Loss of electronic patient records, prescribing, investigations and clinical notetaking.
- Prolonged service disruption with significant operational, clinical and financial impacts.

Impacts identified:
- On patients - Delay to care, inconvenience, moderate harm (e.g. no transplants, lost organs)
- Other NHS services - Primary care and other South East London integrated care system hospitals – divert for specialist services
- Staff wellbeing – fatigue, stress, morale
- **Financial cost - £1.4m out-of-plan spending**

Lessons learnt and next steps

A full review was undertaken and published. Root causes were identified and lessons learnt based on these:
- Too few people with knowledge to restore data.
- Risk management framework did not capture risk of high temperatures to data centre (trip switch activation 2018 at St Thomas's due to heat).
- Some planned mitigations following 2018 were not carried out and not kept on record to do.
- Sub-optimal cooling; ageing technological infrastructure.

Relevant Climate Costs Framework step(s):

1 2 3 4 5 6

What internal teams/roles were involved?

- IT and digital services
- Clinical services
- Third party data centres

4. Hammersmith and Fulham Council – Water Butts Project

Organisation:	Hammersmith and Fulham (H&F) Council	Year:	2025 - present

The Water Butts Project is a pilot adaptation initiative delivered alongside Highways Sustainable Drainage Systems installed across multiple H&F neighbourhoods, including private and Council-owned housing, aiming to reduce surface water flood risk through the installation of up to 510 slow-release water butts at residential properties. The project is funded through the £100,000 H&F Green Investment Fund and seeks to provide a low cost, scalable, property level SuDS intervention, inspired by a similar project in Waltham Forest.

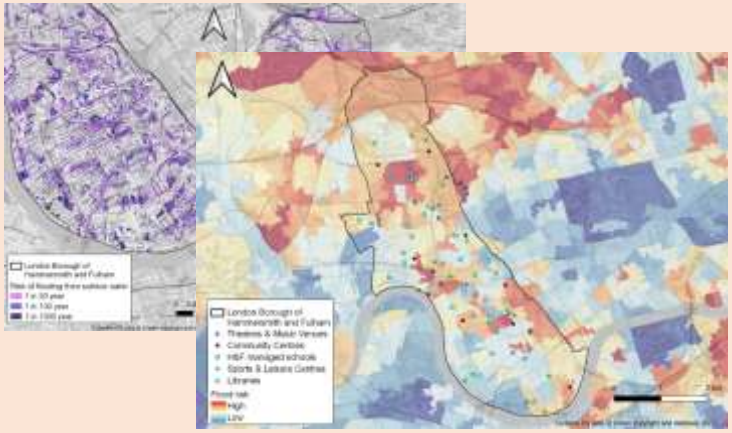
Scoping for the water butts was undertaken with the Housing Net Zero team responsible for decarbonisation and retrofit across council-owned housing, and Highways Healthy Streets who perform LLFA duties for H&F and deliver SuDS schemes on council highways. The Council's Climate Risk Assessment was also used to identify key areas of risk. These areas are receiving larger SuDS schemes such as rain gardens.

Residents are approached through letters included as part of the consultation and notice of works on the SuDS schemes. They are offered a water butt with a hose and connector which allows them to either keep the water to reuse, or to direct water collected during rainfall/ storms to permeable surfaces. This is a low-cost, scalable solution allowing for quicker rollout compared to traditional SuDS schemes.

The full planned roll-out includes 510 water butt units equating to around £25,000 in capital spend with an allocated budget for modifications, delivery, and contract management of £75,000. Once all 510 water butts are delivered, they will provide around 50,000-70,000L of water capacity for ~30% of the budget of a SuDS raingardens scheme. This should reduce localised runoff during peak intensity rainfall, improve community climate awareness and household-level resilience in high-risk streets, and provide high value-for-money alongside larger SuDS projects.

Lessons learnt and next steps

- **Define technical specifications early:** Rush to deliver led to lack of clarity across teams, meaning contractors initially purchased the incorrect shape water butt.
- **Clear roles/ responsibilities in place:** Teams initially had confusion on communications and delivery responsibilities.
- Need for consistent monitoring and tagging of benefit outcomes to be implemented.
- **Community engagement in-person is essential:** Letter drops only achieve partial take up. In retrofit projects door-knocking and discussions with resident groups significantly increases take up.



Relevant Climate Costs Framework step(s):

1 2 3 4 5 6

What internal teams/roles were involved?

- **Climate Change and Transport: Ecology & Adaptation Team** – Project Lead
- **Housing: Asset Management, Net Zero and Social Housing Retrofit Team** – Coordinator/ Contractor Management/ Delivery within Council-Owned Housing
- **Highways: Healthy Streets Team (LLFA)** – Coordinator/ Contractor Management
- **Primary Contractor** – Delivery to private properties
- **Housing Repairs Contractor** – Installation within council-owned housing.

5. Mayor's Office – Climate budgets

Organisation: Greater London Authority (GLA) **Year:** 2022 - present

Climate budgeting is a governance system for governments/local authorities to integrate climate targets into existing budgetary processes. This ensures cities are transparent in achieving/not achieving climate targets, allows for more scrutiny in projects/policies and inform decision-making in planning. This includes monitoring and tracking climate change impacts as well as spending on resilience measures.

The Mayor's budget sets out the spend for London's public services aligning to the Mayor's strategic priorities. This is published each financial year. This includes a climate budget for adaptation measures against the impacts of climate change. Each scheme has the funding and impacts/benefits outlined. For example, for FY 25/26, this included implementation of TfL's Green Infrastructure & Biodiversity Plan and Adaptation Plan and TfL's contribution not the Clean & Healthy Waterways programme.

London took a phased approach to climate budgeting to gradually expand its scope and ambition. From July 2022, the GLA embedded climate budgeting into its standard budget guidance and issued tailored guidance to departments on assessing climate impacts.

These are published on the TfL website here.

Relevant Climate Costs Framework step(s):

1 2 3 4 **5** **6**

What internal teams/roles were involved?

Greater London Authority (GLA):
- London Mayor
- London Assembly: Review the budget.
- Functional bodies including Transport for London, Mayor's Office for Policing and Crime and the London Fire Commissioner.

Public stakeholders:
- Londoners: Review the budget.

6. City of Edinburgh Council – Analysis of costs of climate impacts and adaptation actions

Organisation: City of Edinburgh Council **Year:** 2024 - 2025

City of Edinburgh Council (CEC) commissioned AtkinsRéalis to undertake a review of costs/damages related to major climate change impacts, and the costs and benefits of key adaptation measures across the city:

- **Costs of key climate impacts** – A review of literature and past climate-related events in the city was carried out to estimate climate damages to key sectors. Expected annual damages from flooding are ~£45m/yr at present and are projected to increase to £170-220m/yr by 2080, under +2°C and +4°C end of century scenarios. Health related issues due to heat and drought are estimated to cost ~£4-20m/yr in 2030 (+2°C), rising to ~£31-100m/yr by 2100 (+4°C). Productivity impacts due to heat were estimated up to £182m/yr at present.
- **Stakeholder engagement** - CEC and partners across the city were interviewed to discuss climate impacts and adaptation efforts. Engagement found that stakeholders generally recognise the rising costs due to climate change, but are limited by incomplete monitoring of impacts and costs, with unclear responsibilities for this.
- **Cost of key adaptation actions** – Costs were estimated and benefits considered of key actions: (a) SuDS implementation across Edinburgh to manage surface water flooding; and (b) residential building adaptation retrofits to reduce overheating in urban areas exposed to high summer temperature.

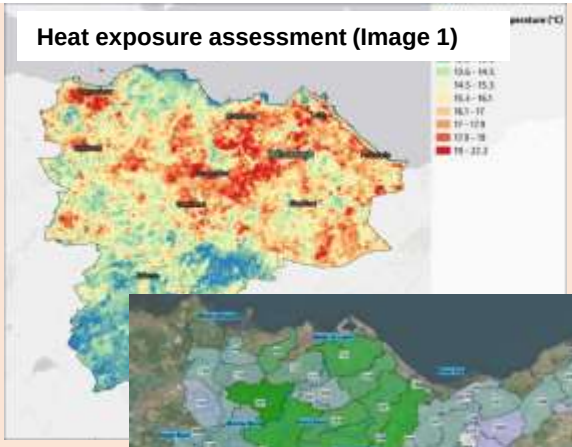
(Image 1) LandSat data was used to identify buildings at risk of overheating. Adaptation actions were identified for different housings types, enabling costs to be estimated for adapting at-risk housing, found to be between £1.5-3b. Retrofitting housing would help to manage the estimated ~£5.5b heat-related damages (estimated over a 30-year assessment period).

(Image 2) SuDs opportunity mapping aligned with CIRIA guidance and SuDS costing found that SuDS implementation across the city would cost around £2.5b to reduce surface water flooding damages (>£0.1bn). Natural capital valuation estimated SuDS would deliver £2.4b in multi-benefits, indicating a positive return on investment compared to doing nothing over a 40-year assessment.

Lessons learnt and next steps

Based on the analysis and findings of the assessment, recommendations were made including:

- Establish city-wide, cross-organisation monitoring for tracking climate change impacts (costs) and expenditure on adaptation, to further build the business case for investment in adaptation.
- Promote responsibilities related to climate adaptation, including data collection (costs and investment) to improve governance and raise awareness within and across organisations.
- Enhance partnership working across the city to understand and share climate-related impacts and costs, sharing knowledge and promoting collaboration between organisations who bare major costs related to climate change. This aims to pool / optimise / streamline investment into city-wide adaptation.



Relevant Climate Costs Framework step(s):

1 2 3 4 5 6

What internal teams/roles (Partners) were involved?

- Climate Adaptation and Nature Partnership
- Transport officers (Network Rail, Lothian Buses)
- City planning and council asset managers
- Parks and biodiversity officers (Nature Scot)
- Poverty, health and wellbeing (NHS Lothian)
- Culture and Tourism (Culture for Climate Scotland)

Worked Example – How a fictional organisation may implement all six steps of the Framework

This case study is an example of a fictional museum in London. This example focuses on the impact of heatwaves to demonstrate the framework process in practice.

1. Understand how weather and climate change currently affect your finances

1a. Understand your existing data on impacts and engage with stakeholders

The museum's data and reporting team gathers data from other functions such as facilities management, maintenance and finance to understand the existing data that they have. They use this to assess what analysis is feasible to complete to understand current cost impacts.

	Facilities management	Maintenance	Finance	
Available data	Energy use	Maintenance logs	Revenue from ticket sales	...
	Facility inspection logs	Parts purchases	Revenue from retail sales	
	⋮			

1b. Identify climate related hazards and their impacts

Heatwaves have historically led to a drop in visitors, an increased risk of collection damage from high humidity and temperatures, and a heightened reliance on emergency systems. This became especially clear during a 10-day heatwave faced in July 2022. Compared to other climate hazards, heatwaves have posed the biggest risk and the museum chooses to initially complete a costings analysis on heat-related impacts.

The museum categorises the impacts from heatwaves against its KPIs based on what can feasibly be calculated from their available data.

Worked Example – How a fictional organisation may implement all six steps of the Framework

1. Understand how weather and climate change currently affect your finances

1c. Understand the current cost impacts of weather/climate change

The museum uses its existing data to calculate an estimated cost against each impact.

Gaps in the data have been documented. For example, there were limited tagging of incidents to specific hazards before 2022, so a lack of data to rely on. Assumptions have also been documented, for example, assuming that a drop in walk-up tickets sold was entirely due to the heatwave, and not by other factors such as the exhibitions' contents.

KPI's affected	Impact	Baseline	Heatwave Outcome	Change	Calculations	Current Estimated Cost Impact per Heatwave
Booked ticket sales (£10 per ticket)	Drop in visitors	£250,000	£220,000	- £30,000	Baseline = 2500 booked tickets/day x 10 days × £10 = £250,000; Heatwave = £22,000 over 10 days = £220,000	**-£50,000**
Walk-Up ticket sales (£15 per ticket)		£120,000	£114,000	- £6,000	Baseline walk-up ticket sales over 10-days = 8,000 x £15 = £120,000; Heatwave = 7,600 ticket sales x £15 = £114,000	
Retail Income		£162,500	£148,500	- £14,000	£4.90 = average spent per visitor; Baseline = £4.90 x 33,000 = £162,500; Heatwave = 29,600 × £4.90 = £145,632. Add + £2,868 for extra cold drink and ice cream sales = £148,500	
Collection safety	Increased risk of collection damage due to high humidity and temperatures	0 incidents	5 incidents	- £5000	£1000 per incident x 5 incidents = £5000	**-£6,800**
Compliance / Accreditation		6 hours out of range	40 hours out of range	- £1,800	Environmental audit & remedial report	
Energy use	Heightened reliance on emergency systems	95,000 kWh	113,500 kWh	- £4,255	18,500 difference × £0.23/kWh = £4,255	**-£15,805**
Maintenance costs from asset failures		Routine servicing	Emergency servicing and parts	- £11,550	Servicing £2,800; filters £450; refrigerant £900; HVAC failure causing a few hours of closure – Total estimated cost was £7400	

Worked Example – How a fictional organisation may implement all six steps of the Framework

2. Estimate how future climate scenarios impact your future finances

2a. Identify the uplift variables for each climate hazard and impact

The relevant climate driver selected for assessment is the 'number of heatwave events per year.' As a proxy indicator, the 'number of Met Office-defined heatwaves per year by 2030 under RCP 4.5 and RCP 8.5 scenarios' has been chosen. In London, climate projections indicate that heatwave events could increase to approximately 1.8 per year under RCP 4.5 and around 2.5 per year under RCP 8.5 by 2030. A simple multiplication uplift has been applied to estimate the annual economic impact associated with heatwave events.

RCP4.5 and RCP8.5 have been used to demonstrate the range of possible future outcomes, with RCP4.5 assuming significant mitigation efforts leading to a decline in emissions, and RCP 8.5 as a worst-case scenario where emissions continue to rise. This also demonstrates the sensitivity of risk to different levels of climate change and allows for more informed decision making.

2b. Apply climate uplifts to the current costs to determine the future impact of climate change

A simple multiplication uplift has been applied to estimate the annual economic impact associated with heatwave events.

Impacts from Step 1	Cost of one heatwave in 2022	RCP 4.5 - Estimated cost of 1.8 heatwaves per year by 2030	RCP 8.5 - Estimated cost of 2.5 heatwaves per year by 2030
Drop in visitors	£50,000	£89,150	£123,300
Increased risk of collection damage due to high humidity and temperatures	£6,800	£12,124	£16,769
Heightened reliance on emergency systems	£15,805	£28,180	£38,975
Total	**£72,605**	**£129,455**	**£179,044**

Assumptions have also been stated, for example, assuming that the heatwaves are of a similar intensity to the 2022 heatwave and therefore provide similar effects.

Worked Example – How a fictional organisation may implement all six steps of the Framework

3. Identify a range of possible adaptation measures

3a. Develop a long-list of actions

The museum develops the following long-list of actions:

Light building retrofits:
- **External shading:** Reduces solar gain, improves visitor comfort, protects collections.
- **Reflective window films:** Lowers indoor temperatures and reduces reliance on emergency cooling.
- **Portable fans for spot cooling:** Provides immediate relief in event spaces.

Deep Building Retrofits
- **Upgraded HVAC systems with zoning:** Targeted cooling, reduces energy spikes and protects collection.
- **Automated climate control and monitoring:** Targeted cooling, reduced staffing hours.
- **High performance insulation:** Reduces reliance on energy intensive air-conditioning.

Nature based Solutions
- **Green roofs and living walls:** Absorb heat, reduce building temperatures,
- **Tree planting for shade:** Provides outdoor cooling for queues/ events.

Operational Measures
- **Temporary shade structures for outdoor queues/events:** Maintains attendance and comfort.
- **Relocation to cooler spaces:** Maintains attendance and comfort.
- **Flexible opening hours (e.g. evenings during heatwaves):** Maintains attendance and comfort.

3b. Shortlist actions through a Multi-Criteria Analysis

The museum short lists to two preferable adaptation measures by completing a light-touch multi-criteria analysis to assess each measure:

Action	Core risk reduction	Co-benefits	Feasibility	Scalability	Timeline	Flexibility
External shading	✓	✗	✓	✓	✓	✓
Reflective window film	✓	✗	✓	✓	✓	✓
Portable fans for spot cooling	✗	✗	✗	✓	✓	✓
Upgraded HVAC systems with zoning	✓	✗	✗	✗	✓	✗
…						

Shortlisted options identified

Based on revenue data, the finance team recognise that some impacts are at least partly outside of what the museum can control. For example, the museum's visitor numbers are highly dependent on the transport sector's adaptation to climate change efforts - visitors may be unwilling to travel using a very hot London Underground train during a heatwave event. This is useful insight to be shared across London, to help make the city-wide case for adaptation action.

Worked Example – How a fictional organisation may implement all six steps of the Framework

4. Assess and select the most cost-effective adaptation actions

4a. Estimate the cost of implementing each short-listed action

Costs are estimated for each short-listed action. The below example shows the calculations completed for window blinds/shades:

Base input costs:
- Number of windows: 120
- Unit cost per blind/shade: £350
- Installation cost per window: £80
- Access/scaffolding (lump sum): £5,000
- Contractor preliminaries (lump sum): £2,000

Capital Expenditure (CAPEX):
- Blinds/shades: 120 × £350 = £42,000
- Installation: 120 × £80 = £9,600
- Access/scaffolding: £5,000
- Contractor prelims: £2,000

Total CAPEX: £42,000 + £9,600 + £5,000 + £2,000 = **£58,600**

Operational Expenditure (OPEX):
- Annual maintenance (cleaning, minor repairs): 120 × £15
- **Total OPEX: £1,800/year**
- **Lifespan of each window blinds/shade = 20 years**

Total Action Cost = £58,600 + £1,800 x 20 years **= £94,600**

4b. Estimate the avoided cost

Costs are estimated for the avoided cost and payback time for each RCP4.5/8.5. Below shows the calculations completed to assess the cost-effectiveness for window blinds / shades:

The museum estimates that implementing the measure will mitigate 20% of the future annual cost impacts from heatwaves. This is an indicative estimate as the museum assumes that window blinds/shades will be more effective compared to reflective film (avoided cost on next slide) based on engagement with suppliers. It is assumed that the annual avoided cost going forward from 2022 is the calculated 2030 cost. The museum documents these assumptions and limitations recognising that these costs are an overestimate.

Under the RCP 4.5 scenario:

Annual estimated avoided cost = £25,891 (= £129,455 x 20% effectiveness)

Payback time = 2.4 years [= £58,600 / (£22,895 - £1,800)]

Under the RCP 8.5 scenario:

Annual estimated voided cost = £35,808 (= £179,044 x 20%)

Payback time = 1.7 years [= £58,600 / (£35,808 - £1,800)]

Worked Example – How a fictional organisation may implement all six steps of the Framework

4. Assess and select the most cost-effective adaptation actions

4c. Identify the most cost-effective actions for implementation

The measures were then screened and prioritised based on cost-effectiveness, feasibility, life span and maintenance requirements, and alignment with organisational goals. A few of the measures were chosen to be implemented based on this screening, an excerpt of the process can be seen below. Of the measures chosen, external window blinds/ shades will be examined to further demonstrate the process.

Measure	Total Action Cost	Annual avoided cost	Payback time	Action
External window blinds/shades	**£94,600**	**£25k - £36k**	**1.7 – 2.4 years**	Selected option consulted and validated with facilities management. Taken forward for implementation
Reflective window film	£60,000	£10k – £14k	3.5 – 6.1 years	Payback time is not optimal. Other options are investigated.

Selected option taken forward for implementation with financial implications assessed in Step 5.

Worked Example – How a fictional organisation may implement all six steps of the Framework

5. Track the cost-effectiveness of implementing weather and climate change adaptation measures

5a. Integrate adaptation costs into existing management systems

A tracking system was established and integrated into existing finance and asset management systems.

A dedicated project code: “ADAPT-HEAT-BLINDS-2025” was set up . All invoices, purchase order, and payments for blinds/shades installation are logged under this code. All capital costs (blinds, installation, scaffolding, contractor prelims) are recorded as one-off expenditures. Ongoing maintenance costs (annual cleaning, minor repairs) are logged quarterly under the same code. Each cost entry is tagged with a climate driver, risk category and asset/function.

5b. Tag cost entries with relevant information

For example, external window blinds was tagged:

- **Primary Tag, Climate Driver:** Heat
- **Secondary Tag, Risk Category:** Collection risk, Revenue risk
- **Asset/ function:** Galleries, entrances
- Tagging fields were kept simple and user-friendly to minimise administrative burden. Dropdown menus were added to the finance system to support consistent terminology and reduce tagging errors.

This data is monitored and updated regularly. The finance team reviews spend against budget each month, any cost overruns or savings are flagged and investigated. A dashboard is created to show actual vs budget spend. Total adaptation spend is then aggregated by climate driver and risk category for reporting.

Worked Example – How a fictional organisation may implement all six steps of the Framework

6. Monitor, evaluate, learn and embed the benefits of implementing these measures into future decision-making

6a Define 'extent of success' metrics

The museum set measurable success metrics, using the categories in the framework:

- **Degree of financial effectiveness:** 20% reduction in heat-related disruption costs compared with the 2022 baseline.
- **Extent of risk reduction:** Reduction in climate-related incidents affecting collections, aiming for 0-1 incidents per summer vs 5 incidents in 2022.
- **Value for money:** Track updated payback period each year, expected that payback remains between 1.7 – 2.4 years.

The museum also created rating bands to allow consistent comparisons:

- **Not effective:** Meets <40% of expected savings or no risk reduction.
- **Partially effective:** Meets 40–80% of expected savings or reduces some risk.
- **Highly effective:** Meets >80% of expected savings and significantly reduces risk.

6b. Calculate financial outcomes

After the first year of operation, the museum compared observed results to baseline and projections:

Realised avoided losses

- Retained revenue from less significant decrease in visitors of £5k.
- No collection-damage incidents occurred saving £5k from 2022.
- Compliance and accreditation costs, only 10 hours out of range of required humidity levels in 2023 compared to 2022 saving £500.
- £5k less spent on maintenance from asset failures as a result of heat
- Less energy was used to cool the museum down, saving a total of £2k.

Net avoided cost (year 1) – Total: £17.5k avoided impact costs vs. expected £25k - £36k.

- 27% of CAPEX costs have already been paid back through avoided costs.
- Expected pay back time of 3.7 years based on this figure.

6c. Measure residual risk

The museum assessed the residual risk left after installation and evaluates future adaptation priorities:

Proportion of original risk removed

- Collection-damage risk reduced by ~70–90% (from 5 incidents to 0).
- Heat-related revenue loss reduced by ~75%.

Remaining risks

- Extreme heat events beyond the capability of blinds alone (e.g., >35°C days).
- Energy-intensive emergency cooling still needed during the hottest peaks.

Sufficiency of the measure

- Blinds alone are not fully sufficient to eliminate heat-related risk, additional HVAC upgrades will likely be required over time.

Future adaptation priorities

- Museum flags HVAC modernisation as the next prioritised action.

Worked Example – How a fictional organisation may implement all six steps of the Framework

6. Monitor, evaluate and learn from the benefits of implementing adaptation measures, and feedback into future decision-making

6d. Evaluate outcomes

The museum then integrated the financial outcomes and residual-risk assessment with the success metrics defined:

Degree of financial effectiveness (6b):
- Overall avoided costs within the first year of implementation of £17.5k (48% - 70% of expected saving).
- As per the original calculation in Step 4, the estimated avoided costs is an overestimate as the annual figure were based on the 2030 uplifts.

Value for Money (6b):
- Based on the avoided costs of the first year of implementation, the payback time is expected to be 3.7 years from implementation compared to the estimated 1.7 – 2.4 years.

Extent of risk reduction (6c):
- Overall risk of collection-damage has reduced with some remaining risks.

Overall rating based success metrics defined (6a):
- Partially/highly effective in financial effectiveness and value for money.
- Highly effective for risk reduction.

6e. Set up a financial monitoring plan

A monitoring plan was developed, with improved data collection (e.g., energy meters to record HVAC electricity use monthly, comfort surveys distributed during hot periods) and dedicated responsibility (e.g., facilities team to track energy data).

This data is reviewed monthly during summer, and an annual summary is conducted.

Worked Example – How a fictional organisation may implement all six steps of the Framework

Embed a cycle of monitoring, evaluation and learning to continually improve the process

The museum records what worked well, and what could be improved. These lessons are captured in a structured template for comparability with future projects.

The museum then sets up a feedback process, sharing results with leadership and relevant teams to strengthen future work.

Example lessons learnt:

Calculations:
- Original calculation of avoided costs is an overestimate as they are based on 2030 uplifts, use of climate uplifts to be refined.

Financial data:
- Tagging system worked well; some early inconsistencies required correction.

Implementation:
- Total installation cost aligned with forecasts except one minor access-equipment delay.
- Procurement was smooth; contractor communication effective.

Cross-team coordination:
- Collaboration between Facilities and Finance teams strong
- Visitor-services team noted the need for earlier communication about gallery changes.

Other useful resources

Below are some additional resources that you may want to refer to while you are costing for climate:

Source	Description
RAPA (Rapid Adaptation Pathways Assessment) Toolkit	Toolkit created by ADEPT (Association of Directors of Environment, Economy, Planning and Transport) and the Environmental Agency aimed to provide guidance for facilitator's on implementing RAPA which are high-level adaptation pathways developed in a workshop setting.
EU Climate-ADAPT	Platform for climate adaptation knowledge, providing reliable, up-to-date information on expected climate impacts, case studies, and decision-support tools, supporting better-informed and evidence-based adaptation. It provides a useful general six-stage approach for climate adaptation, that informed this framework's 'cost-lens' approach.
MACC (Maximising UK Adaptation to Climate Change) Hub	The MACC hub aims to address climate risks by examining the levers of change for adaptation in the UK and advancing transformative climate adaptation strategies.
C40 Cities - Climate Action Planning for Adaptation	C40 Cities provides a wealth of international knowledge into climate adaptation planning for cities through a variety resources covering topics including climate risk assessments, adaptation governance, developing a climate adaptation plan and monitoring and evaluation.
ISO14090: Adaptation to Climate Change	International standards specifying the principles, requirements and guidelines for adaptation to climate change.
ISO14001: Environmental Management Systems	Framework and international standards for organisations to designing and implementing EMS (environmental management systems).
ISO14091: Adaptation to climate change - Guidelines on vulnerability, impacts and risk assessment	International standards providing guidelines for assessing the risks related to the potential impacts of climate change.

Other useful resources (Sector specific materials)

Below are some additional resources that you may want to refer to while you are costing for climate for specific sectors:

Sector	Source	Description
Healthcare	**Climate adaptation framework for NHS organisations in England**	Resource developed to support NHS organisations to adapt to climate change providing a holistic approach to organisational change in the context of preparing/responding to climate change impacts.
Transport	**Department for Transport: Climate adaptation strategy for transport - GOV.UK**	Actions to set the long-term strategic direction for adaptation the transport sector to the impacts of climate change by the DfT.
	UITP – Adapting Public Transport to Climate Change: the Key for Resilient Cities	Framework developed by UITP (International Association of Public Transport) to provide guidance on understanding climate risks, as well as identify and implement effective adaptation interventions.
Local authorities	**Local Partnerships - Climate Adaptation Toolkit**	A five-step process designed to help local authorities prepare for the current and future climate created by Local Partnerships.
Local communities	**The London Community Resilience Toolkit**	This toolkit is designed to help London's communities get started on their community resilience journey. It offers practical information and guidance to help communities better prepare for and respond to future challenges and emergencies.