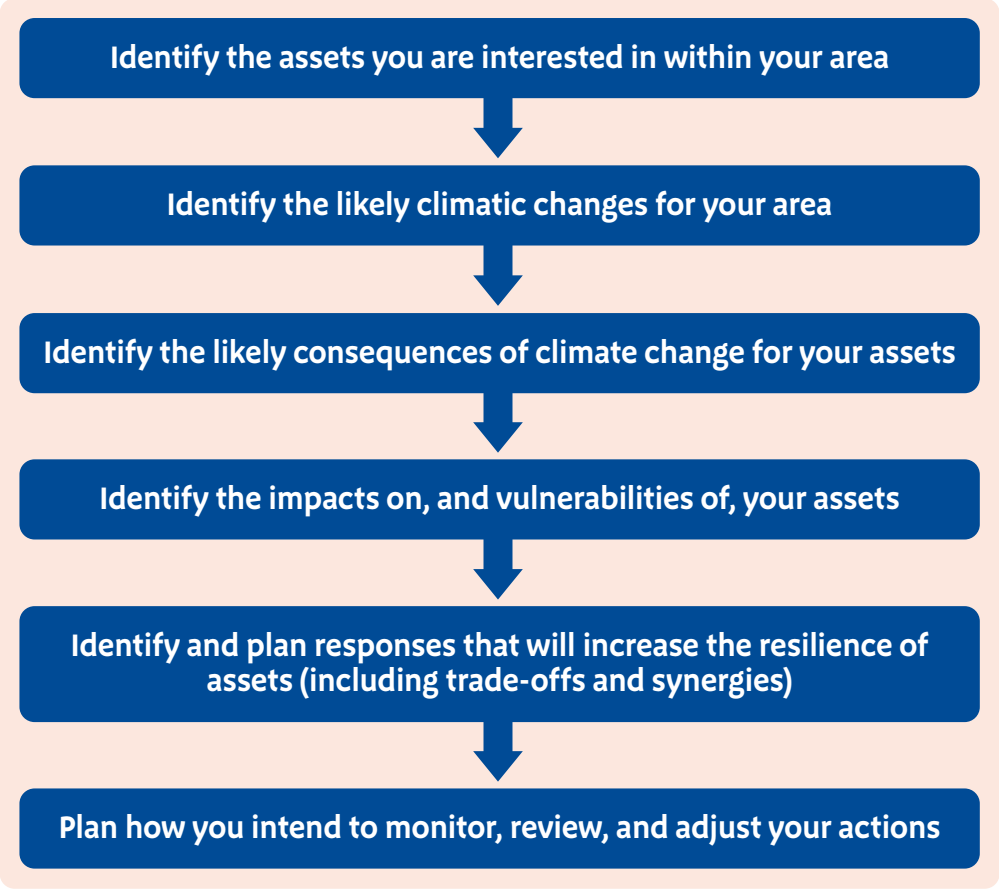
Annex 1: Natural England's Landscape Scale Climate Change Assessment Methodology

This guidance has been developed by Natural England to assist those wanting to undertake a climate change vulnerability assessment for an area larger than an individual site or specific environmental feature. It is intended to be flexible and can be adapted for use in a range of area-wide projects and planning exercises. It is offered in this manual as just one possible approach to assessing the possible implications of climate change for an area. Other assessment methodologies developed by other organisations are available.

This series of flow charts is designed to help carry out a high level assessment of the impacts of climate change within a project area and to help inform the action that can be taken to address these impacts. Our approach to climate change assessment has been developed over a number of years and has been refined for use in landscape-scale conservation projects. We have also produced and contributed to a wide range of evidence, research, data and analysis that forms the basis of the resources provided to work through the assessment process. The degree of consultation and stakeholder involvement in the process can vary depending on the time and resources available. The overall steps in the assessment are illustrated in simplified form in the flow chart below.

While this approach focuses on identifying vulnerabilities to climate change, it is important to recognise that climate change may have some positive impacts, as described elsewhere in this manual. Where potential benefits or opportunities are identified, these should be recorded in the **impacts and responses table** and reflected in the subsequent action plan.



The following flow charts are provided to guide you through the assessment and to highlight some of the information available to assist with the process.

STEP 1

IDENTIFY the key assets and ecosystem services you are interested in within the project area

By the end of this step you will have identified and, where possible, mapped, the habitats, species and other natural assets that form the building blocks of the area and that you want to assess; and also the ecosystem services provided in the area and their importance to the people that live there.

What are the KEY natural assets identified within the project area?

Use existing work in the project area to identify which assets are important within the area. **NCA profiles** may be helpful, as will any relevant protected area management plans, such as for AONBs or National Parks.

You can also note how these assets relate to the delivery of Ecosystem Services, if you have identified these.

Features will include habitats, species, landscape features, historic remains, geological features, ecosystem services, and other natural assets that are important within the project area.

Keep this list relatively short, focus on the most important, indicative or iconic assets in your area.

Group the KEY natural assets identified for the project area.

Group assets by theme, e.g. habitats, species, geology, soils etc. Also identify the ecosystem services provided in and around the project area, in order to identify which assets are important for the delivery of each service.

Grouping them will help make them more manageable to assess and easier to map. Use the impacts and responses template available **here**.

Map the KEY natural assets identified within the project area.

This step will help you to understand what you have and where it is and will relate to actions you will plan in later stages e.g. where to enhance the current ecological network in your area.

These can be existing maps if you have them, or you can use **Magic.Gov** to identify these if you do not have pre-existing asset maps, or request data from the **Natural England Open Data Geoportal**

MOVE TO STEP 2

STEP 2

IDENTIFY the climate change projections for your area

By the end of this step you will have an understanding of what the latest climate change projections say about changes in climate variables (e.g. temperature and rainfall) in your area. The most up to date projections of climate change in the UK are the **UK Climate Projections 2018** *produced by the Met Office. Links to the UKCP18 key results and factsheets can be found below.*

Have a look at the UKCP18 climate change projections.

→ UKCP18 Factsheets can be found **here**.

UKCP18 Key results can be found **here**.

The UKCP18 home page is **here**.

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Make a note of the projected changes in variables for your area. Log them in your **impacts and responses table**.

→ These projections will help you identify the causes and consequences of the impacts and vulnerability of your assets in the next steps.

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MOVE TO STEP 3

STEP 3

Identify the CAUSES and CONSEQUENCES of climate change on the key assets and ecosystem services identified for your project area

By the end of this step you will have identified the causes and consequences of climate change for the key assets you have identified.

Causes are the climate change variables that will drive change, e.g. drier summers or warmer winters. Consequences are what happens as a result of these changes, e.g. drought or flooding. These will come together to provide indications of the possible impacts on the features identified.

Identify the relevant climate change causes and consequences for each feature.

Causes include - drier summers, hotter summers, warmer winters, wetter winters, increased frequency of storms, high intensity rainfall events, changes in precipitation, increased annual average temperature, reduction in annual average rainfall, sea level rise etc.

Consequences include - drought, flooding, longer growing season, fewer frost events, tidal flooding, saline intrusion, higher storm surge events, reduced soil moisture, waterlogging, erosion, high winds, higher volume of water run-off from land, low water levels/flows, changes in water temperature, higher evapotranspiration rates etc.

This manual will be an important source of information for this step.

The following resources can also provide information:

Natural England's **National Character Area profiles** are a core reference for impacts at a local scale. Natural England has also undertaken more in-depth climate change **vulnerability assessments** for a small number of NCAs.

The **climate change report cards** on biodiversity, the water environment, agriculture and forestry etc. provide the latest overview of impacts across the natural environment.

Record the causes and consequences you have identified for each asset in your **impacts and responses table** (you will use this in steps 4 & 5)

MOVE TO STEP 4

STEP 4

Assess the IMPACTS on, and VULNERABILITIES of, or OPPORTUNITIES for, the key assets and ecosystem services to climate change and other pressures (and interactions between them)

By the end of this step you will have used the information previously gathered on climate change causes and consequences to identify the impacts from these changes on your important features. You will also use your knowledge about the location and condition of the natural assets within your project area to assess how they may be vulnerable to climate change. There may also be opportunities that can be identified.

Vulnerability refers to the ways in which the climate change impacts you have identified could have a negative effect on your asset. For example, increased summer flooding might be an impact and the vulnerability may be that ground nesting bird's nests are vulnerable to destruction. A further vulnerability may be that if the frequency of flooding increases, the success of one or a number of breeding seasons could be reduced over time. Equally, flooding could be an issue in your area but the management of a particular asset may mean that it is not vulnerable to it. This will involve local judgements, informed by guidance on the vulnerability of the features identified to the particular aspect of climate change. The purpose of this assessment is to enable the prioritisation of actions.

Use existing resources to identify climate change impacts on the natural assets you have identified for your project area. Referring to these identified impacts, describe how your assets may be vulnerable to climate change. This could include information on the current state of the asset (if the condition is currently poor the asset may be more vulnerable), the size of habitat/population (smaller may be more vulnerable), heterogeneity (i.e. habitat mosaics), external pressures such as pollution, development nearby, over use etc. Gather extra information and opinions from colleagues and partners, it would be good to reach a consensus on impacts and vulnerabilities.

The following resources can provide information:

- Natural England's **National Character Area profiles** are a core reference for impacts at a local scale. More in-depth vulnerability assessments for selected NCAs are also available.
- The **climate change report cards** (and their source papers) on biodiversity, the water environment, agriculture and forestry etc. provide the latest overview of impacts across the natural environment.
- Subsequent chapters of this manual will contain useful information, particularly the individual habitat sheets and species case studies.
- For information on species, Natural England recently published a **report** on the risk and opportunities for species as a result of climate change. This Manual also includes a section on species.
- Published sources of information should be supplemented by local knowledge and expert judgement, and the assessment should take into account specific local circumstances.

Your conclusions should be entered into the **vulnerability assessment table**.

Review the available spatial data that can help you determine factors that contribute to vulnerability (e.g. condition, habitat fragmentation) and the spatial distribution of vulnerability (or specific adaptation actions in step 5).

Use the suite of climate change related datasets developed by Natural England and others to add a spatial element to your vulnerability assessment. This will help to determine which locations are most vulnerable and where vulnerable assets are located, and help with prioritising adaptation action. Use this **flow chart** to help you incorporate spatial data.

Think also about how climate change impacts could affect ecosystem services, or interact with each other to raise the priority of some issues.

MOVE TO STEP 5

STEP 5

PLAN for integrated action

This step draws together the information gathered previously on impacts and vulnerability in order to plan key actions for the project area. By the end of it you will have developed integrated objectives, prioritised and mapped actions, and agreed how they will be taken forward through a delivery plan.

Identify adaptation actions to address the previously identified impacts and vulnerabilities.

Use the **vulnerability assessment table** to identify appropriate adaptation responses.

This Manual provides more specific information on adaptation options for habitats and species and will form a core resource for planning your adaptation actions.

This **Decision Support Framework** may also help. For non-biodiversity features, the chapters within this manual on geology, access and recreation, and green infrastructure may help, and other organisations such as Historic England have published guidance. In many cases though, combinations of online search and expert judgement may be the best (and only) options.

Think about how you can link adaptation actions to the ecosystem services supplied in the area.

Detail how delivery might reduce the vulnerabilities of assets and services within the project area and how delivery of integrated actions will achieve climate change adaptation and mitigation objectives.

Integrated adaptation, including integrating with our partners, will start out as individual adaptation ideas. When you have a long list you need to cross check the actions for any win-win/no regrets actions or unintended impacts, trade-offs, win-lose issues etc.

Consider having a workshop or meeting session to develop integrated actions.

If possible, invite partners so they can jointly identify existing and planned action and to ensure all partners key objectives are included.

Plan spatial action through use of spatial data.

For biodiversity, use the Lawton Principles (Bigger, Better, More, Joined Up) to help with planning to reduce vulnerability. Resources that may help with this include:

- Natural England's **Nature Networks Evidence Handbook**,
- the **WrEN** project on woodland creation and ecological networks,
- the **GREEN** project on invertebrate colonisation of arable reversion sites,
- Natural England's **research report** on evaluating landscape connectivity and the risks from invasive species.

Link your adaptation actions to other targets, e.g. delivering habitat creation and ecosystem restoration can contribute to biodiversity targets and the 25 Year Environment Plan.

Investigate how the available data can help determine where actions are most needed or may be most effective. This **flow chart** will help you to use the available spatial data.

Agree an integrated delivery plan for the key landscape scale project area objectives.

Provide detail on what successful delivery of actions would be and how this is determined.

MOVE TO STEP 6

STEP 6

DELIVER, COMMUNICATE, MONITOR and ADJUST

This step allows you to explore how you will monitor and periodically adjust your adaptation actions. Early thinking on what can be done to monitor intended delivery outcomes is crucial to allow you to determine success and identify any adjustments required.

Plan how your adaptation actions will be delivered in line with the impacts and vulnerabilities identified, and how they will be monitored and reviewed, and if necessary adjusted, to maximise their effectiveness over time.

Consider the following:

- What are the key indicators that will determine successful adaptation?
- Are there useful monitoring procedures already in place that you can make use of?
- Are the right partners involved?

We understand not all project areas will have an established delivery plan. The completion of this adaptation assessment can help provide an action plan for the area.

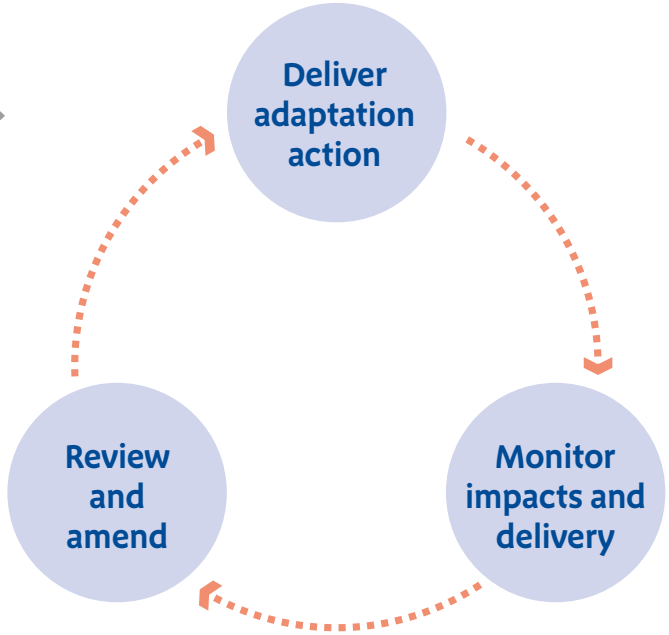
Set a schedule for reviewing the impacts of climate change and the effectiveness of these adaptation actions. Include these commitments in your plan.

You should be prepared to amend adaptation actions if they are not working.

Where possible, ensure that any monitoring or spatial data produced feeds back in to data held by Natural England and others and into the further development of climate change adaptation planning. For example, you could get in touch with Natural England via the **Open Data Portal**.

Integrate climate change action in to existing plans, programmes and partnerships.

Communicate your plan to all relevant partners, especially if they have not been involved in the process. Join up and support will make your plan more likely to succeed.



FINAL ACTIVITY

You could write a short summary narrative of the climate change understanding you have developed for your area to share with your team, organisation or partners, which can be used elsewhere and incorporated into other documents and plans affecting the project area.

Natural England's Landscape Scale Climate Change Assessment Methodology Annex 1:

Impacts and responses table

Asset	The cause – the change in climate variable	The consequences of climate change in relation to the climate variable	Potential impacts and vulnerabilities - Direct or Indirect	Adaptation response
The habitats, species, ecosystem services, other natural assets etc. that are most important to your area. *Keep this list relatively short, focus on the most important/ indicative/iconic assets in your area.*	*E.g. drier summers, hotter summers, warmer winters, wetter winters, increased frequency of storms, high intensity rainfall events, changes in precipitation, increased annual average temperature, reduction in annual average rainfall, sea level rise…*	*E.g. drought, flooding, longer growing season, fewer frost events, tidal flooding, saline intrusion, higher storm surge events, reduced soil moisture, waterlogging, erosion, high winds, higher volume of land run-off, low water levels/flows, changes in water temperature, higher evapotranspiration rates…*	*Identify direct impacts from climate change on your asset. E.g. if salt marsh is an asset in your area, the 'roll back' of this habitat over habitats that exist behind it may be a direct impact of sea level rise.* *Identify all the indirect impacts from climate change on your asset. E.g. if the 'roll back' of this habitat as a response to sea level rise is impeded by coastal defences, the loss of this habitat due to coastal squeeze would be an indirect impact.* *Identify all direct and indirect impacts on your assets* **NB – if you don't have time to list specific vulnerabilities a High, Medium or Low ranking can be used to carry out a 'fast track' assessment.**	*Identify the adaptation responses you need to make to address the vulnerabilities identified. E.g. for the salt marsh example - allow for realignment of shorelines and adequate space and sediment for shoreline adjustment through strategic coastal planning.*

Natural England's Landscape Scale Climate Change Assessment Methodology Annex 2:

Spatial data use

The use of spatial data will enhance the assessment for your project area. It can supplement the stages on assessing vulnerability and planning adaptation by highlighting the spatial distribution of factors that might increase vulnerability to climate change, and also attributes to be protected and enhanced. Please see **Natural England's Nature Networks Handbook** *for more information on how to plan ecological networks. Chapter 4 of the Handbook gives an introduction to some of the available data and tools. Contact* **Adaptationmanual@naturalengland.org.uk** *for further information. The following chart gives some examples of Natural England datasets and how they can help you plan spatially in your area.*

National Biodiversity Climate Change Vulnerability Assessment data and tool.

→ **ASSESSING CURRENT VULNERABILITY** – this data will provide you with information on a series of metrics that describe some elements of how habitats will be vulnerable – sensitivity to direct climate change impacts, habitat fragmentation, topographic variety and current management and condition. There is also a tool to allow different assessments to be carried out.

Natural England's National Habitat Network

Carbon storage & sequestration data

→ **POTENTIAL ENHANCEMENTS** – Natural England's National Habitat Network data show where there are opportunities for habitat creation and restoration in close proximity to existing habitat (request from Natural England Open Geodata Portal).

If you have datasets for carbon storage and sequestration they can help identify synergies for ecosystem services.

Climate change refugia data

→ **NEEDS PROTECTION** – this data highlights areas that may provide refugia for species in a changing climate (where they may continue to persist for longest). These areas could receive enhanced levels of protection under a climate change action plan.

Species risks and opportunities data

→ **POTENTIAL ENHANCEMENTS** – these maps may help you see how species may want to move through the landscape and could help identify areas for key ecological network enhancements for key species.

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Find useful spatial data at **Magic.Gov** or request data from the **Natural England Open Data Geoportal**

OTHER TOOLS – there are a number of other tools out there that could be useful. Natural England has worked with the University of Liverpool on the **CONDATIS** tool which you may want to use. There are other tools available for you to explore, please see **Natural England's Nature Networks Handbook** for more information.