

Adaptation Reporting Power : supplementary guidance for Reporting Authorities

Who should use this guidance

This guidance is for organisations in England or Wales who have received a UK Government Direction or invitation to report under the [Adaptation Reporting Power](#).

Reporting authorities are not *required* to have regard to this guidance, but we hope that it will be a useful source of information.

Guidance scope and structure

The guidance is designed to help reporting authorities produce a high-quality report that meets the Government's criteria. It is intended to complement the *Statutory Guidance to Reporting Authorities 2009*. We recommend that you [read the statutory guidance](#) before consulting the information in this document.

Our guidance is structured according to the following key areas of climate change risk where the Environment Agency has particular expertise and responsibility:

- [Flooding](#)
- [Coastal change](#)
- [Water resources](#).

Within each of these areas the guidance provides information and advice to help you at key stages of your reporting process: assessing current risks, assessing future climate change risk and in identifying appropriate adaptation actions.

We have also included a section on Appraising options. The statutory guidance makes clear that the success of an adaptive measure depends upon assessing its broader impacts, including its impact on the natural environment (para. 5.18). The adaptation actions you take should aim to minimise the environmental impacts and where possible develop actions that benefit wildlife. This section also includes advice on ensuring your adaptation measures do not increase flood risk elsewhere. (Go to the [Appraising options](#) section.)

The Environment Agency's Adaptation Report

The Environment Agency is also a reporting authority and we were asked to be one of the 'early reporters'. We have now submitted our report and will publish it on this website once it is signed off by Defra. You can see the approach we used to assess our climate risks and develop adaptation plans by downloading [our methodology](#).

In addition, we have had an Adaptation Strategy since 2005, and each of our functions has conducted a climate change risk assessment and developed an action plan, including areas such as land quality, industry regulation, monitoring and assessment, marine waters, recreation and navigation, radioactive substances regulation and waste. You can [read summaries of these action plans on our website](#).

[> Read about using this guidance](#)

Using this guidance

You should use this guidance flexibly to meet your needs and organisation's circumstances. It aims to help you assess risks from the current and future climate in the areas of flood risk, coastal change and water resources. In some cases it can help you rule these out as risks you do not need to address further.

We cannot tell you what your exact risks are, or the best way to respond. You are best placed to do that. To complete your report you may want to consider several other sources of information and advice. For example:

- Using UKCIP's [Business Areas Climate Impacts Assessment Tool](#) to understand what climate change risks will affect your organisation
- Consulting UKCIP's [Risk Framework and adaptation wizard](#) for help developing a risk assessment
- Using the [user guidance](#) on UKCP09 for help in deciding what climate projections or scenarios to use
- Consulting the [HM Treasury's Green Book](#) and its supplementary guidance for advice on how to carry out a full economic assessment of the social costs and benefits of adaptation plans

Our guidance focuses on specific types of climate change risk, but you should also consider the interaction between these and other risks. Many adaptation measures help to manage more than one risk, or have other benefits such as reducing greenhouse gas emissions or enhancing the natural environment. The section on [appraising options](#) provides some advice and case studies on solutions with multiple benefits.

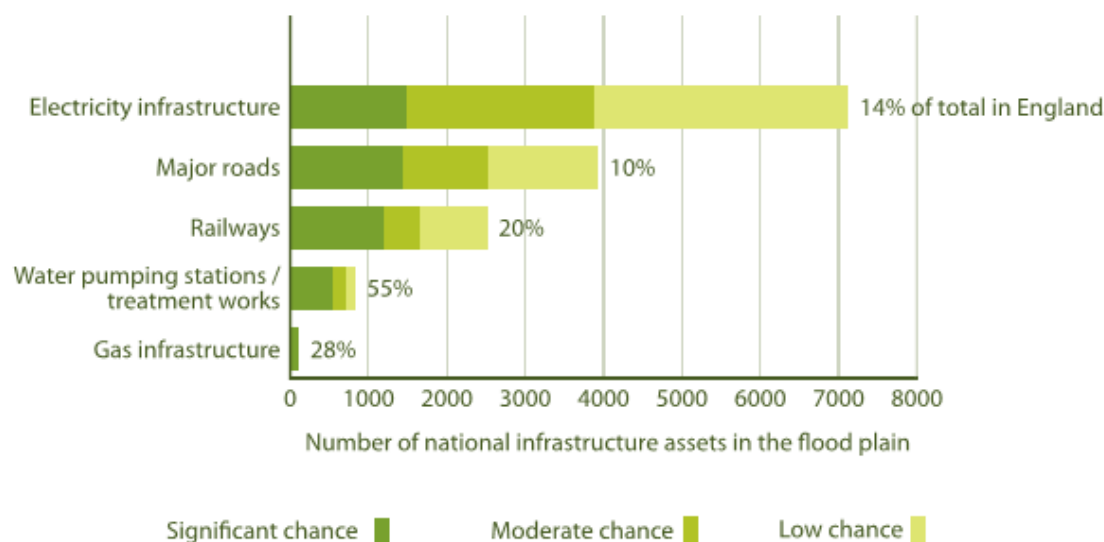
As reporting authorities assess their climate change risks, they may become aware of exposure to *current* climatic risks. Reducing this existing risk may contribute to your overall adaptation response.

Although the information we signpost on this website is the best available, we know that the rate of future climate change and its impacts are uncertain. Adaptation responses should be flexible enough to allow for this uncertainty.

Managing flood risk in a changing climate

Flood risk and climate change

We know that national infrastructure is already at risk from flooding. Our [national flood risk assessment](#) showed that a significant proportion of infrastructure for energy, transport, water and health is already at risk. The floods in Cumbria in 2009, and more widespread flooding in summer 2007, affected bridges, roads, railways, water treatment works and electricity sub-stations, as well as homes, businesses and public services. The figure below shows that a significant proportion of various types of infrastructure in England is in floodplains.



National infrastructure assets (transport and utilities) in floodplain areas (NaFRA, 2008).

Climate change will increase this risk of flooding. More intense downpours will lead to more flooding from rivers, surface water, sewers, groundwater and a combination of these sources. Increasing sea level and greater storm surges will lead to more flooding at the coast.

Increased flood risk will be one of the greatest impacts of climate change in the future. Adaptation is about planning now to help prepare for that future.

What you should do

This guidance will help you carry out an initial assessment to identify those assets in areas currently at risk of flooding, and to get an indication of how climate change will affect those risks or present new risks. We then suggest that, for those assets found to be vulnerable, you carry out a more detailed assessment which takes account of future climate change.

Your risk assessments should make use of the best available evidence on flooding – some of which we can provide. We can also provide general advice to help you manage flood risks. Much of this information and advice can be obtained free-of-charge on this website following the links below.

Step 1 - [Initial assessment of current flood risk](#)

Step 2 – [Screening assessment of future flood risk](#)

Step 3 - [Detailed assessment of your current and future flood risk](#)

Step 4 - [Identifying options for managing flood risk](#)

Step 5 - [Appraising adaptation options](#)

Step1 (FRM): Initial assessment of current flood risk

This section will help you carry out an initial assessment to identify those assets in areas currently at risk of flooding, and to get an indication of how climate change will affect those risks or present new risks. We then suggest that, for those assets found to be vulnerable, you carry out a more detailed assessment which takes account of future climate change.

- > [Using our flood mapping in an initial assessment](#)
- > [Historic Flood Information](#)
- > [Current risk from surface water flooding](#)

Using flood mapping in an initial assessment

The [online flood maps](#) [embed link below] show *current* flood risk and use the best available data of flooding from rivers or the sea. The flood maps shows:

- Natural floodplains - Flood Zones 2 and 3
- Flood defences and the areas they benefit
- The flood likelihood – low, moderate or significant

These flood maps are not sufficiently detailed to show the risk of flooding to an individual property or specific site. We can, for a fee, provide the data that underpins the maps. Read a [fuller explanation of our flood maps](#)

Please note, they *do not* take climate change into account. For an initial assessment of future flood risk you should see [Step 2](#) in this guidance.

[Access our flood maps](#)

You can request a printed copy of flood maps for your location, for your private use, by [contacting us](#).

Historic Flood Information

We can provide information on historic flooding and our 'Historic Flood Map' shows the combined extents of known flooding from rivers, the sea and groundwater. Understanding past flooding events may be useful as part of your initial assessment of current flood risk at a specific site. If some of those floods were on sites you manage or on systems that are similar to yours, you could investigate the impacts those floods had to understand the extent to which the community or organisation was prepared and able to respond to those flood events.

If an area is not shown to have flooded in the past, this does not mean it has not flooded or could not flood in the future. Similarly in some instances an area that has flooded in the past may no longer be at risk of flooding (for example if ground levels have been raised).

By summer 2010 we will also have developed a historic dataset of areas affected by surface water and groundwater flooding.

[Contact us](#) to obtain information from the Historic Flood Map or for more information.

Current risks from surface water flooding

Surface water flooding happens when the ground, rivers and drains cannot cope with heavy rainfall. This type of flooding is usually localised and happens quickly after the rain has fallen, making it difficult to give any warning. Climate change is expected to lead to heavier downpours of rain, leading to a greater likelihood of surface water flooding.

The risk of surface water flooding is less understood than flooding from rivers or the sea. Work continues to improve the understanding and mapping of areas at risk from surface water flooding. However small changes to ground levels, such as kerbs, and obstructions to flow, such as blockages in drains, can make a big difference to where the water flows and causes flooding. Such details may need to be considered using local, more detailed observations and modelling.

Listed below are the sources of general information on surface water flood risk. We recommend you use more than one source of information to assess your risk.

- We hold data and maps showing areas susceptible to flooding from surface water. This has been developed using a simple method which is suitable only for use in identifying areas where a more detailed assessment of the likelihood of flooding is needed. We have made this data available to Local Resilience Forums, Regional Resilience Teams and local planning authorities, so these organisations and their members (e.g. Civil Contingency category 2 responders¹ such as utilities) can access it themselves. Other organisations can [contact us](#) to find out if a site falls in an area susceptible to surface water flooding.
- We are currently developing more detailed mapping of areas susceptible to surface water flooding. These maps will take better account of buildings and drainage systems than the existing information. They will be useful for assessing current risk but will not take climate change into account. We expect to have developed this mapping by September 2010. [See our website for advice on managing surface water.](#)
- Many local authorities at the greatest risk of surface water flooding are developing **Surface Water Management Plans** which identify local risks. Where these plans have been completed they are available from the local authority. Local planning authorities' Strategic Flood Risk Assessments (in England) or Strategic Flood Consequence Assessments (in Wales) should also highlight local areas subject to flood risk. (Contact local authority for more details.)
- By summer 2010 we will have developed a historic dataset of areas known to have been affected by surface water and groundwater flooding. You can [contact us](#) for more information.
- Catchment Flood Management Plans (CFMPs) give an indication of areas within a catchment susceptible to surface water flooding. [Summaries of CFMPs are available on our website](#) or to get a full version [contact us](#).

¹ Many reporting authorities are category 2 responders including utilities (water, gas, electricity), telecommunications, airports and Network Rail.

Step 2 (FRM): Screening assessment of future flood risk

You can use the documents listed below to get an indication of how climate change will affect your future flood risk. Each of them includes information and maps which take the impacts of climate change into account by applying current Government guidance on the effect of climate change on peak river flows and sea levels. [See our summary of the Government figures](#) or [download them from Defra's website](#).

These documents are also useful for cross-referencing your findings based on our flood maps, as well as getting information about levels of current protection, planned improvements and regional and local policies which may affect your business and assets.

However, the documents do not take into account the full range of potential climate change. Where a site or installation is very vulnerable and has a long lifespan you may need to consider greater rates of change.

Catchment Flood Management Plans (CFMPs)

Reporting authorities can consult their relevant CFMPs for a catchment-level² overview of the scale of flood risk and how it may change this century. CFMPs aim to:

- understand the factors that contribute to flood risk within a catchment both now and in the future;
- recommend the best ways of managing the risk of flooding within the catchment over the next 50 to 100 years.

CFMPs consider all types of inland flooding, from rivers, ground water, surface water and tidal flooding, (but not flooding directly from the sea (coastal flooding), which is covered in Shoreline Management Plans).

CFMPs' assessment of flood risk considers the effect of potential changes, such as climate change, urban development and land use change. Some CFMPs include maps which show the extent of future flood risk, taking into account climate change by adding a sensitivity allowance (of at least 20 per cent) to peak river flows. [Summary versions of the CFMPs are available on our website](#). To get the full version of the CFMPs (including maps of future risk where available) you should [contact us](#).

If you own or operate infrastructure and have been involved in developing a CFMP, you may have actions within it that can contribute to your adaptation report.

Strategic Flood Risk Assessments (SFRAs) and Strategic Flood Consequence Assessments (SFCAs)

SFRAs (SFCAs in Wales) are prepared by local planning authorities (in consultation with us) to help guide local planning. They allow them to understand the local risk of flooding from all sources (including surface water and groundwater). They include analysis and maps of the impact of climate change on the extent of future floods. You can find these documents on the website of your local planning authority.

² Catchment - the land which drains (normally naturally) to a given point on a river or drainage system.

Shoreline Management Plans (SMPs)

Shoreline Management Plans are high-level assessments of the risks associated with sea flooding and erosion, and identify actions to reduce these risks.

Existing SMPs are currently being updated by local authorities in liaison with the Environment Agency. These updated SMPs may be useful for your initial assessment because they assess the long-term risks associated with coastal flooding, taking climate change into account. They also allow you to consider how flood and coastal risk management may evolve as they propose policies for 20, 50 and 100 years into the future. These policies will form the basis for deciding and implementing specific flood and erosion risk management schemes, coastal erosion monitoring and further research on how we can best adapt.

The new SMPs will be accessible through the website of the appropriate co-ordinating Coastal Group. Some are already available and the others will become available in 2010/11. Check [here](#) for links to those that are available to view now.

Step 3 (FRM): Detailed assessment of current and future flood risk

It may be necessary to carry out a more detailed assessment of flood risk for assets shown to be at risk of flooding within the initial screening exercise. A detailed assessment should cover both current and future risks, the risks to the site or asset from all forms of flooding, and the appropriate responses to those risks. Whether you do this will depend on how great you judge the risk (i.e. likelihood and consequence) to be.

Reporting authorities will have to pay particular attention to the development of actions and options that address the increased risks due to climate change (as opposed to current risk.) In preparing your report you may want to distinguish between those actions and options that address current or future risk, or both.

If you own or operate a facility regulated by the environmental permitting regulations then we recommend you undertake an assessment of flood risk.

Detailed assessment of current and future flood risk

Assessment of site-specific current flood risks

We hold flood data and modelling which is crucial to carrying out a detailed assessment of current flood risk.

> Find out more about our [detailed flood modelling information](#).

Factoring in climate change

Our default flood data covers only *current* risks. However, your analysis of flood risk should take into account the impact of climate change over the proposed lifespan of the development or asset.

Applying the Government's climate change allowances

You should first apply the precautionary allowances and indicative sensitivity ranges in Defra's supplementary note on climate change impacts³ (part of Defra's flood and coastal defence appraisal guidance). You can incorporate these allowances and ranges into any site-specific modelling you get from us or do yourself.

> [See our summary of the precautionary allowances and sensitivity ranges.](#)

[You can also download the full version of Defra's guidance.](#)

It should be noted that the existing climate change allowances are based on climate science that predates the UK Climate Projections 2009 and therefore does not take into account the latest science.

Using UKCP09 and applying the latest climate science

If a site is shown to be particularly vulnerable you should consider doing additional testing against a fuller range of possible futures using the latest climate science.

UKCP09 (unlike UKCIP02) are probabilistic projections. Results from initial studies of this wider range of information projects higher winter rainfall. However,

³ This guidance applies in both England and Wales.

this does not equate directly to higher peak river flows and we would not advise users of UKCP09 to use this as proxy information in this way.

We are working with Defra to 'translate' this data into a form which can be used by reporting authorities and other practitioners. This will inform updated guidance on the climate change allowances.

As UKCP09 projects more rainfall it is likely that this will affect the levels of allowance that new guidance will be recommending, and Reporting Authorities will be sent any new guidance as soon as it is available.

In the meantime, it would be prudent for Reporting Authorities to consider the risks of higher winter rainfall and more intense rainfall on their operations. If a site is likely to be particularly vulnerable it would be wise to pay it particular attention in the risk assessment and plan of action.

Assess flood consequence - for those assets where flooding is likely to cause damage or adversely affect function / service, assess the impacts of the flood on the asset's function, and broader service impacts.

Identifying options: Where the outstanding risk remains unacceptable, consider the most appropriate options to reduce risk. Decide a solution based on flood risk, cost benefit analysis and the principles in the Treasury Greenbook supplementary guidance. It is up to you to determine what level of risk is unacceptable. However, the Cabinet Office has proposed, as a minimum standard, that critical infrastructure should be resilient to a flood with a 1-in-200 chance of occurring in any given year.

Appraising Options: Ensure any measures will not have unacceptable consequences, for example on the environment or flood risk elsewhere, and look for multiple benefits. (see [Appraising Options](#) section)

Additional Information

The [practice guide to Planning Policy Statement 25](#) (paragraphs 3.80 - 3.94) gives a more detailed explanation of the principles and approach of flood risk assessment for new developments, and these could also be applied to an assessment of flood risk for an existing site.

For new developments we provide a service to review flood risk assessments which form part of a planning application. For assessments of flood risk at existing developments we may be able to provide a similar service. [Contact us for more information.](#)

Flood modelling and levels

Undertaking site-specific flood risk assessments at important sites will help inform your adaptation planning and ensure it is robust.

We can often make available more detailed information to assist a full assessment of flood risk at specific sites. For many areas at risk of flooding we can provide water **levels** for given flood events at specific sites. There is sometimes a fee associated with this service – [contact us](#) for more details .

You can also acquire our **flood models** for your area of interest. These allow you to develop your own detailed site-specific flood scenarios taking account of the effect of flood risk management infrastructure. We can only provide flood levels and flood models for areas covered by our existing modelling. These are generally areas of high risk such as towns and cities in the flood plain.

Our flood models cover *current* risk and do not take climate change into account. However, the models can be easily adjusted to incorporate climate change, which means you can apply the Government's precautionary allowances and indicative sensitivity ranges for variables such as peak river flow. These figures can be found in [Defra's supplementary note](#) on climate change impacts⁴ (part of Defra's flood and coastal defence appraisal guidance). [See our summary of these Government figures](#)

For more on our flood modelling information, [see our advice on flood risk assessments for planning applications](#). This explains the various products we may be able to offer to support the development of a flood risk assessment .

Flood estimation

Where detailed flood data is not available, organisations can calculate predicted flood flows and levels in accordance with the Flood Estimation Handbook. This handbook can be ordered from [CEH Wallingford](#).

We have produced Flood Estimation Guidelines which explain how we apply the Flood Estimation Handbook and how we expect others to use it. [Contact us](#) for a copy of these guidelines.

⁴ This guidance applies in both England and Wales.

Precautionary climate change allowances

The tables below show the Government's current recommendations for including climate change into flood and coastal defence appraisal guidance. This information can be viewed in full in the Defra's supplementary note on climate change impacts⁵ (part of Defra's flood and coastal defence appraisal guidance). This note contains advice on how to apply these allowances and sensitivity ranges. You can [download the full version of Defra's guidance](#).

These allowances and sensitivity ranges were developed before the UK's latest climate projections (UKCP09) were produced. We believe that in the light of UKCP09 they remain very reasonable estimates of change. However, if your site is particularly vulnerable you should consider testing your vulnerability to higher allowances.

Regional sea level allowances

Administrative or Devolved Region	Assumed Vertical Land Movement (mm/yr)	Net sea level rise (mm/yr)			
		1990-2025	2025-2055	2055-2085	2085-2115
East of England, East Midlands, London, SE England (south of Flamborough Head)	-0.8	4.0	8.5	12.0	15.0
South West and Wales	-0.5	3.5	8.0	11.5	14.5
NW England, NE England, Scotland (north of Flamborough Head)	+0.8	2.5	7.0	10.0	13.0

Indicative Sensitivity Ranges

Parameter	1990-2025	2025-2055	2055-2085	2085-2115
Peak rainfall intensity (preferably for small catchments)	+5%	+10%	+20%	+30%
Peak river flow (preferably for larger catchments)	+10%	+20%		
Offshore wind speed	+5%		+10%	+10%
Extreme wave height	+5%		+10%	+10%

⁵ This guidance applies in both England and Wales.

Flood risk assessment at sites with an environmental permit

Climate change is expected to increase the likelihood of flooding. This in turn will increase the risk of environmental damage caused by flooding, often through the uncontrolled release of pollutants. This risk is greatest at facilities covered by the Environmental Permitting Regulations such as energy, chemical and waste management installations, and at sites covered by the COMAH (Control of Major Accident Hazards) Regulations.

Does your business operate facilities covered by these regulations? If so, as part of your response to climate change, you should minimise the environmental risks of flooding. To do this you may need to carry out a [Flood Risk Assessment](#) (FRA), and then take measures to mitigate any risks identified by the FRA. Such FRAs can contribute to your report to Government under the Adaptation Reporting Power.

Our Environment Officers and Environmental Permitting staff can advise you whether you need to complete an FRA for any particular facility. We can also help you carry out an FRA - [contact us](#) to find out more.

In April 2010 we will release new Delivery Guides which will advise on how climate change adaptation should be taken in the strategy management plans for COMAH sites.

If you are unsure how the Environmental Permitting Regulations relate to your business, more information is available [here](#).

Step 4: Identifying options for managing future flood risk

Once you have assessed your risks from flooding you will need to identify options to address those risks. Most reporting authorities should already be managing vulnerability to the current climate. For your report to Government however, you should also start planning how you will prepare for climate change, especially where you are developing new assets or flood defences with a long lifespan. You could consider the following ways of managing flood risks

- > [Managing Risk Hierarchy](#)
- > [Options to manage flood risk](#)
- > [Other resilience and resistance options](#)

Managing Risk Hierarchy

‘Avoiding risk’ - New infrastructure that is vulnerable to flooding should be located in an area at least risk. You should also think about site access.

‘Substituting’ - Organisations should take any opportunities to relocate vulnerable site uses away from flood risk, or use sites in areas at risk for a less vulnerable purpose.

‘Managing current risks’ - For sites at risk of flooding, there are two broad approaches to reducing the risk: resistance and resilience. Resistance measures control the flow of flood water - for example, land or platform raising, floodwalls, diversion channels and temporary flood defences.

Resilience measures improve a site’s ability to cope with a flood. This might be done through physical improvements, such as fortifying equipment to make it less susceptible to flood damage. Or it might be done through measures which help an organisation return to normal operations after a flood, for example through a business continuity plan. A final type of resilience measure is having backup systems to replace functions that have been lost through flooding.

‘Managing future risks’ - Resistance and resilience measures should reduce current risks *and* future risks. However, because future risks (e.g. those due to climate change) are uncertain it may make sense to manage them through *incremental adaptation*. Incremental adaptation involves measures that can be reviewed periodically against the latest information on climate change. By ensuring that your incremental adaptations are flexible, you can allow for the possibility of adjustment in the future to cope with effects that are more or less severe than anticipated. An example of this is building a flood defence with enough width and space to allow it to be raised in the future.

We followed an approach of incremental adaptation and flexibility in the flood risk management strategy for the Thames Estuary. [Read more about the Thames Estuary 2100 project.](#)

‘Managing residual risks’ - Despite efforts to manage current and future risk, some risk will remain. Organisations could develop contingency plans to manage the residual risk. Where a site has a long lifespan and is highly vulnerable the contingency plan should account for more extreme scenarios which are unlikely but

plausible. (For example, the *high plus plus* scenario for future sea level rise and storm surge in UK's climate projections 2009 – link to coastal section).

'Monitoring' - monitoring is key to understanding how change is actually happening. It can be used to trigger a contingency plan action or to change a planned adaptation. For instance, the rate of incremental adaptation may need to be accelerated if change occurs more quickly than expected.

Options to manage flood risk

Prepare a [Flood Plan](#)

A Flood Plan is a document that sets out how your business will respond to a flood. It outlines the staff training required, the insurance cover needed, evacuation procedures and how a property will be prepared.

[Download our guidance](#) to help you prepare your business for flooding.

Use our business flood plan checklist – [download here](#).

Sign-up for Flood Warnings for Infrastructure

The Flood Warnings for infrastructure service provides infrastructure operators, with targeted warnings allowing you to take action earlier to protect your assets. The service is suitable for any type of asset, development or network, including sewage treatment works, telephone exchanges, offices or depots, motorways and railways. Any organisation which owns or operates fixed assets or networks is eligible to adopt the service. Infrastructure owners and operators interested in the service should [contact us](#).

Sign-up for Flood Forecasting Centre products

The Flood Forecasting Centre (a partnership between the Environment Agency and the Met Office) has developed the following products useful for forecasting floods:

- the *Flood Guidance Statement* - contains a five day forecast of flood risk for England and Wales.
- Extreme Rainfall Alert Service – forecasts and warnings of extreme rainfall. These can help utility companies target the areas most likely to be affected by surface water flooding.

The Flood Forecasting Centre can only provide these products to government organisations and to category 1 and 2 responders (under the Civil Contingencies Act). Many reporting authorities are category 2 responders including utilities (water, gas, electricity), telecommunications, airports and Network Rail. [Contact us](#) to learn more about how to receive these services.

Further flood resilience and resistance options

Listed below are some specific options to consider for avoiding or managing flood risk. (Options in italics are non-structural.) The list is adapted from the CIRIA report *Flood resilience and resistance for critical infrastructure* (table 6, section 6.9). You may find this report a helpful source of guidance on ways to improve the adaptation of critical infrastructure to future flooding and climate change, and how key infrastructure providers can improve the flood resilience and resistance of their assets.

[Download the CIRIA report](#) or [contact us](#) for more information.

Measures which reduce the likelihood of high flows/water levels

- Sustainable drainage (detention basins, filter drains, flow control systems, permeable paving, retention ponds, soakaways, swales, wetlands, green roofs / walls)
- Attenuation reservoirs
- River regulation
- River restoration and floodplain rehabilitation
- Oversized pipes in drainage network
- *Land use policies*

Measures which modify or block flood waters' routes to a site

- Ground raising
- Construction of floodwalls and embankments
- Construction of diversion channels
- Removal or modification of existing structures
- Demountable flood defences
- Temporary flood defences
- Designing drainage networks for exceedance e.g. overland flow routing
- Managed realignment to 'make space for water'

Measures which reduce vulnerability to the impacts of a flood

- Flood resistance measures e.g. flood boards or airbrick covers
- Flood resilience measures e.g. waterproof plaster
- *Business continuity management*
- *Flood risk mapping*
- *Planning policies*
- *Flood insurance*
- *Flood warning services*
- *Emergency response procedures*
- *Enhanced preparedness*

Coastal processes and climate change

Our coastline is always changing. Over the next century and beyond the rate of coastal change is expected to increase, due largely to climate change.

Climate change is causing the rate of sea level rise to increase, and may lead to greater storm surges. At the same time wave energy is expected to increase making storms stronger. Over time this will mean that the natural and artificial barriers that absorb wave energy will become increasingly damaged or submerged. This will result in increased frequency of sea flooding and potential permanent inundation of some low-lying areas, and an increase in coastal erosion.

The Government's *Foresight* report indicates that for a coastal site where erosion is 1m/yr now, we could see rates of 2.0 to 2.6m/yr by the 2080s. This will lead to an ever greater number of assets at risk of erosion and flooding.

Coastal change will affect only a small proportion of national infrastructure. However, where it does have an impact it is usually very serious. You should assess whether your assets or plans are at risk from coastal erosion and flooding, or could become so as climate change increases the risks.

The information on the pages linked below will help you determine how these risks affect you, and how to reduce any impact.

Step 1 – > [Initial assessment of current risk at the coast](#)

Step 2 – > [Screening assessment of future risk at the coast](#)

Step 3 – > [Detailed assessment of your current and future risk at the coast](#)

Step 4 – > [Options for managing the risk from climate change at the coast](#)

Step 5 – > [Appraising adaptation options](#)

Step 1: Initial assessment of current risk at the coast

You may wish to carry out an initial assessment to identify any of your assets or plans which could be at risk from coastal erosion and sea flooding. The resources outlined below could be useful for this type of assessment.

Our flood maps – for flooding from the sea

Our flood maps are a good starting point to establish whether you have assets at current risk of coastal flooding. These maps use the best available data to give an initial indication of the flood risk to an area of land. You can use the flood maps to identify any assets that merit more detailed flood risk assessment. ([Go to our flood maps.](#))

Coastal Erosion Risk Mapping tool

Our new coastal erosion risk mapping tool can help you decide whether your organisation is at risk of coastal erosion. It will be a valuable resource for any high-level assessment of coastal risks. During 2010-11 we will publish the risk mapping data for England on our website, and we will publish similar information for Wales in 2011-12.

Step 2: Screening assessment of future risk at the coast

Coastal Erosion Risk Mapping tool

Our new coastal erosion risk mapping tool can help you decide whether your organisation is at risk of coastal erosion. It will be a valuable resource for any high-level assessment of coastal risks. During 2010-11 we will publish the risk mapping data for England on our website, and we will publish similar information for Wales in 2011-12.

The coastal erosion mapping tool will present:

- the predicted erosion rate for 0-20 years, 20-50 years and 50-100 years into the future, taking climate change into account
- the range of predicted erosion rates for each of these timescales, reflecting the full range of confidence bands (from 5 to 95 per cent)
- erosion information in an interactive web-based format – using Ordnance Survey maps to provide context

The mapping tool gives a useful indication of risk from erosion, but is insufficiently detailed to show the risk to an individual property or specific site. The tool will not show predicted changes in foreshore features such as beaches and salt marsh – although it may do in the future.

This erosion information is designed to complement our web-based flood maps. On a stretch of coastline where the predominant risk is from sea flooding, users will be directed to the flood maps.

Shoreline Management Plans (SMPs)

[Shoreline Management Plans](#) are high-level assessments of the risks associated with sea flooding and erosion, and identify actions to reduce these risks.

Existing SMPs are currently being updated by local authorities in liaison with the Environment Agency. These updated SMPs may be useful for your initial assessment because they assess the long-term risks associated with coastal flooding, taking climate change into account. They also allow you to consider how flood and coastal risk management may evolve as they propose policies for 20, 50 and 100 years into the future. These policies will form the basis for deciding and implementing specific flood and erosion risk management schemes, coastal erosion monitoring and further research on how we can best adapt.

The new SMPs will be accessible through the website of the appropriate co-ordinating Coastal Group. Some are already available and the others will become available later 2010/11. [See which SMPs are available now.](#)

Receptors vulnerable to coastal erosion in England and Wales

We are working to improve our understanding of who and what (including infrastructure) is in an area at risk from coastal change. When this work is complete we will have a picture of what critical infrastructure at the coast is vulnerable to future erosion. We plan to release results during 2010-11 and will update this guidance accordingly.

Step 3 - Detailed assessment of current and future risk at the coast

Where an initial assessment identifies potential risk, you will want to carry out a more detailed assessment as to the level of risk, and compare this to the level of risk you are prepared to accept or manage. This information may help with a detailed assessment of coastal risk.

Detailed assessment of flood risk at the coast

To carry out a detailed assessment for flood risk, consult Step 3 in the [flood risk section](#) of this guidance.

Additional Information

In addition, you may also want to consider the following additional information, especially if you are particularly vulnerable to sea flooding or coastal erosion.

Preparing for extreme sea level rise

Defra's [current appraisal guidance](#) is based on the UK's previous climate projections – UKCIP02. This guidance is still valid and should be used. However, if you are vulnerable to sea flooding or coastal erosion, you may also want to explore the impact of larger changes based on more updated climate science, such as UKCP09.

Draft planning policy is currently proposing the use of “credible maximum scenarios” for long-term planning. Such scenarios would be at the extreme end and of low probability, but plausible and based on scientific evidence. An example of such a scenario for sea level rise and storm surge is provided by the UK's latest climate change projections (UKCP09) which present the *high plus plus* (H++) scenario in which sea levels rise by 0.93-1.90m by 2100.

You may want to assess whether your organisation is resilient to the credible maximum scenario at the coast or could adapt to that degree if required. We used UKCP09's H++ scenario in developing a flood risk management strategy for the Thames Estuary. Due to the importance of the assets protected by this strategy, we ensured that plans were flexible enough to cope with a sea level rise of 1.90m – the extreme end of the H++ scenario. [Read more about the Thames Estuary 2100 project.](#)

Current coastal extremes

The Environment Agency and Defra are updating information on extreme sea levels and swell wave conditions. This will include:

- a consistent set of extreme sea levels around England, Wales and Scotland
- a consistent set of swell wave conditions around England, Wales and Scotland
- practical guidance on using this data

This information relates to current extreme sea levels and wave conditions. You can use it to develop a scenario for future extreme sea levels which factors in climate change by adding the [Government's precautionary allowances and indicative sensitivity ranges](#).

From summer 2010 you will be able to get this coastal extreme information by [contacting us](#).

Coastal Groups

Coastal groups consist of maritime local authorities and other bodies with coastal management responsibilities. They may be able to provide you with additional information or expertise to help you assess climate change risk at the coast. Coastal groups have [websites accessible through Defra's website](#).

Step 4 - Options for managing the risk from climate change at the coast

In developing options to manage coastal risk you may find it useful to consider [our advice on managing flood risk in a changing climate](#).

Additional information

Shoreline Management Plans (SMPs)

The new SMPs contain proposals for how to manage the coast to reduce risk from flooding and coastal erosion. These proposals may help you identify your own options to manage risk. [Read more about the newly updated SMPs](#). You will also be able to use our [coastal erosion mapping tool](#) to identify broad Shoreline Management Plan policies for the entire coast.

Foresight report on flood and coastal defence

This report looked at flood and coastal defence in the UK between 2030 and 2100. It considered flooding from rivers and the sea, as well the risks of coastal erosion. Volume II of the report, [Managing Future Risks](#), analyses potential responses to manage the increased risks of coastal erosion and flooding (including coastal flooding).

Coastal Handbook

Our Coastal Handbook includes a large range of information on coastal management, including guidance on adaptation and resilience.

Climate change and water resources

Future water availability in England and Wales is increasingly under pressure. Demand may increase due to several long-term trends - climate change, increasing population, housing growth and changes in lifestyle. At the same time, due to climate change, water availability may decrease.

According to our research, by the 2050s there could be a decrease in natural river flows of up to 15 per cent over the course of a year. This decrease could be far greater in summer (50-80 per cent), and many groundwater supplies may also decline.

The [latest climate change projections](#) (UKCP09) confirm that summers are likely to get drier, winters wetter, and more rainfall may come in big downpours. However, the range of rainfall projections in UKCP09 is large, which means there is great uncertainty for water resource planning.

There is a risk that within a few decades we will not have enough water for people, businesses and the environment. As part of your climate change risk assessment, you should assess the vulnerability of your organisation to future water shortages.

You should also consider whether you are vulnerable to any deterioration in water quality. Less water in the environment will reduce the ability of rivers to dilute pollutants, and more frequent storms will lead to more short-term pollution incidents as contaminants are flushed off land into water. Higher temperatures and increased pollution could also encourage algal growth which would further reduce water quality. [Read more about water quality and water temperature.](#)

The information on the pages linked below will help you determine how these risks affect you, and how to reduce any impact. This information is aimed at three distinct groups of water users:

- Water companies
- Major water abstractors – (other than water companies)
- Business customers – (mains water account holders).

Steps 1 & 2: Assessing your current *and* future risks

[> Water companies](#)

[> Major water abstractors](#)

[> Business customers](#)

Step 3: Detailed assessments - currently unavailable, please contact us if you think you need to do more detailed assessments at this stage.

Step 4: Options for managing risk

[> Water companies](#)

[> Major water abstractors](#)

[> Business customers](#)

Step 5: > Appraising adaptation options

Considering water quality and water temperature

Water quality

Climate change may lead to deterioration in water quality, threatening the water environment and the quality of your supplies. This may prompt more controls on the sources of contaminants, and lead to increased treatment requirements when water is abstracted for drinking supply or other uses. At the same time there will be economic and regulatory pressure to reduce the greenhouse emissions associated with water treatment. You may want to assess how these factors could affect your functions, and whether there are business critical thresholds.

You can [consult the latest River Basin Management Plan](#) (annex G: “*Pressures and Risks*” and annex A: “*Current state of waters*”) to find out if water quality is a problem or risk in your area.

Water temperature

Climate change is also likely to increase the temperature of water bodies. This may affect some uses of water, for example where a permit specifies a maximum temperature for discharged water. During the 2003 heatwave 17 nuclear reactors in France were shut down because the water they used for cooling was too hot to return to the environment according to national regulations.

You may want to assess how increased temperature of abstracted water could affect your functions, and again whether there are business critical thresholds.

Steps 1 & 2: Assessing your current and future risks

Water companies

All water companies take climate change into account as part of their business planning, and can use this work as part of their adaptation reports for Government. The documents most likely to be useful in this regard are:

- Strategic Direction Statements
- Water resources management plans
- Business plans
- Drought plans.

Water companies normally consider the impacts of climate change over the next 20-25 years. However, under the Reporting Power requirements, water companies may wish to look beyond this. For a more long-term assessment companies could look at our study of future river flows. This study indicates that by the 2050s we could see:

- a potential drop in average annual river flow by as much as 10–15 per cent
- a decrease in mean monthly river flows during summer and autumn of around 50 per cent, with a fall of up to 80 per cent in some areas
- an increase in mean monthly river flows during winter of up to 15 per cent.

For an indication of how the mean monthly natural flow of rivers in your area may change by the 2050s, see the summary of our study [Climate change and river flows in the 2050s](#).

This study was based on the UK's previous climate projections published in 2002 (UKCIP02), and we would not recommend that you use them for detailed quantitative analysis. However, they can be used as part of a high-level assessment of future water challenges.

Further information you could use for your risk assessment.

- Water UK has developed an [adaptation planning tool](#) for the water industry to assess adaptation risks and incorporate them into asset management planning.
- In partnership with the water industry, we are carrying out a study using UKCP09 to assess the impacts of climate change on river flows. We will publish initial results in summer 2010.
- UK Water Industry Research (UKWIR) has carried out an initial assessment of the significance of UKCP09 for water company resources planning. Contact [UKWIR](#) for more information.

Steps 1 & 2: Assessing your current and future risks

Water abstractors

We recommend that you assess your vulnerability to both current and future reductions in the amount of water you are able to abstract.

You could carry out **sensitivity tests** to find out if there are business critical thresholds for lower water availability. How would you cope if the amount of water available to you reduced by, for example, 5, 10, 25 or 50 per cent? Exploring this will tell you if the potential impact on future water supplies is something that you should investigate in more detail.

Assessment of current risks

Catchment Abstraction Management Strategy (CAMS)

For an indication of water availability in your area you can consult the relevant Catchment Abstraction Management Strategy (CAMS). These plans, produced by us, show water availability in each water resource management unit, and how we propose to manage water resources. [Read more about CAMS](#).

Impacts on the environment

In many parts of England and Wales, there is no more water available to take without damaging the environment. Over-abstraction can affect rivers, lakes and groundwater. Consult the [latest River Basin Management Plan](#) for your area (annex G: "Pressures and Risks") to find out if catchments in your area are over-abstracted from the point of view of the water environment.

Historical data on droughts

Climate change is likely to increase the frequency and severity of summer droughts. To help you assess the potential impacts of periods of low rainfall, it may help to look at data on groundwater and river flows during past droughts, such as the one in 1976. You can find our [historical river flow data on the website of the Centre for Ecology and Hydrology](#).

Our study [The impact of climate change on severe droughts](#) details drought events in the UK since 1800 and provides evidence of their impact. For more detailed advice on water availability or over-abstraction in particular areas please [contact us](#).

Assessment of future risks

For an indication of how the mean monthly natural flow of rivers in your area may change by the 2050s, see the summary of our study [Climate change and river flows in the 2050s](#). This study was based on the UK's previous climate projections published in 2002 (UKCIP02), and we would not recommend that you use them for detailed quantitative analysis. However, they can be used as part of a high-level assessment of future water challenges.

Steps 1 & 2: Assessing your current and future risks

Business customers

Water audit

The first thing you need to do is work out how much water you currently use. Our simple [“waterwise” guide](#) sets out the steps required to establish a baseline:

- check water bills to determine typical annual consumption and cost
- consider related costs such as for heating or treatment of water
- produce a ‘water balance’ which lists and quantifies items and their water use

Assessing current risk

Water company plans

Water companies have a statutory duty to plan for water resource availability and to take account of future climate change. Their business plans and water resource management plans do this for the next 25 years and are freely available from their websites. You should contact them if you have any questions regarding your current water supply.

Water company drought plans

Climate change is likely to lead to lower summer rainfall in England and Wales. Water companies can apply to the Government or National Assembly for Wales for a drought order. This allows them to prohibit or limit certain uses of water (e.g. operating mechanical vehicle washers). As part of your initial assessment of your vulnerability to reduced water availability, you could determine whether your organisation would be affected if a water company implemented its drought plan. See the drought plan on the water company’s website for more details.

[Read more about possible restrictions on public water supplies during a drought.](#)

Assessing future risks

Sensitivity tests

We recommend that you consider a range of scenarios to assess your organisation’s vulnerability to future restrictions on water supply. Using your water audit as a baseline, we suggest you carry out **sensitivity tests** to find out if there are business critical thresholds for lower water availability. Exploring this will tell you if the potential impact on future water supplies is something that you should investigate in more detail.

Water company adaptation reports

Longer term climate change risk are not routinely planned for by water companies although many do have information that looks further ahead. All water companies are also reporting authorities and if you are a major business customer then we recommend that you contact your water company to ask to be consulted on their development of their adaptation reports.

Future water pricing

In the long-term pressures on water resources may lead to water becoming more expensive. As part of your risk assessment you may wish to determine how sensitive you would be to increases in the cost of water.

Step 4: Options for managing water resources risk

Water companies and other abstractors

Our water resources strategy advocates a careful choice of supply and demand options to help ensure water resources will be more resilient to climate change. We believe it will be important that water companies and other abstractors apply a twin-track approach and consider first options that reduce demand and make best use of available supplies before developing new resources. Our water resources strategy for England and Wales as well as our water resources strategy for Wales only can be found at www.environment-agency.gov.uk/wrs.

Measures that we suggest you consider include:

- Demand management:
 - reducing leakage
 - promoting efficient use of water
 - water reuse and recycling technologies
 - water neutrality

- Better use of existing water resources
 - local and inter-basin water transfers
 - conjunctive use of supplies from different sources
 - re-use of highly treated effluent
 - better land management to increase base-flows in rivers.

New supply options -

- new or enlarged reservoirs (including carbon footprint and long term viability).
- other water storage options

Adaptive capacity –

- New research into impacts and adaptation actions
- Partnerships with other stakeholders or reporting authorities (link to case studies)

Water resources action plans

Water companies and water abstractors should also consider our [action plans for the English regions and Wales](#) which show how the actions within the water resources strategies will be delivered at a regional level.

River Basin Management Plans (RBMPs)

Water companies and water abstractors should consider any actions contained in RBMPs and how these might contribute to their adaptation reports.

Forthcoming Research

The water industry is currently also working with the Environment Agency to re-evaluate future river flows using the latest climate projections. Water companies could also include planned actions that reduce the impact of their activities on the water environment.

[Contact us](#) if you would like to discuss how to identify and develop options for managing climate risks from water resources.

Step 4: Options for managing water resources risk

Business customers

Water efficiency

One important adaptation action you can take to prepare for future water shortages is to **reduce water use**. Saving water is often a low-regret option as it also saves money. Many organisations could save up to 50% of their water bill through water efficiency measures.

If your organisation uses less water it will be more resilient to future restrictions on its use. An additional benefit is that using less water, especially hot water, reduces emissions of greenhouse gases. Reducing water use also helps reduce the amount of wastewater that needs to be pumped and treated and the costs associated with this.

Water management plan

Ensure you have first conducted a water audit, as detailed in [Step 1](#). Our simple “waterwise” guide then sets out the steps required to establish a plan to achieve water savings, by:

- identifying and planning water saving measures (many of which maybe be no-cost or very cheap)
- setting targets for saving water and money
- identifying those responsible for carrying out the plan.

[Download the “waterwise” guide.](#)

Our publication [Conserving water in buildings](#) may help identify ways of saving water by modernising water using devices such as taps, toilets and plumbing systems. Download here:

Envirowise can give you more information, advice and case studies on saving water. [Their website offers free tools](#) to monitor your water consumption and compare with businesses in your sector. They also offer advice for businesses who want to save water. In Wales [Flexible Support for Business](#) offer support on improving water efficiency.

Water reuse and recycling

Some organisations may be able to use less water and save money by either rainwater harvesting or reuse of greywater or process water. Another option is implementing larger-scale water storage as a way of managing the increased variability of rainfall. However, it will be important to calculate the greenhouse gas emissions involved, as these measures can lead to higher energy use than using mains water. Using less water should always be the first action you consider.

[Download our guides on rainwater harvesting and greywater recycling.](#)

And you can find out more about rainwater harvesting from [Envirowise](#).

Appraising your adaptation options for environmental impacts

It is important to appraise your adaptation options to establish that they are the best way of meeting your overall objectives. Sometimes it will be more practical to delay appraising an option until you are ready to deliver it.

A key aspect of this appraisal will be to confirm whether your identified options successfully manage your climate change risk in a way that allows you to perform your functions. But another important aspect is to assess the wider impacts associated with each option.

The choices between options can involve significant costs and environmental and social impacts. Below we present information and advice on how to appraise options for their environmental impacts or benefits.

- We suggest that you give preference to adaptation options which have a lower impact on the natural environment. Read more about how to [*Avoid damaging the natural environment*](#).
- In particular we recommend measures which work with the environment and actually enhance it at the same time as increasing resilience. Read more about [*Delivering multiple benefits*](#).
- It is important that your adaptation options do not increase flood risk in other parts of a catchment. Read more about [*Avoiding increasing flood risk elsewhere*](#).

In addition to appraising options from an environmental perspective, you might also want to consider how your options follow the principles and guidelines contained in the Treasury's [Green Book Supplementary Guidance](#), including:

- Avoiding constraining the ability of others to adapt
- Promoting flexibility
- Ensure an equitable and fair outcome
- Increase understanding through monitoring and evaluation.
- Help you develop investment plans for adaptation.

Delivering multiple benefits

In some cases, adapting to the future climate will only require small changes to existing ways of working. But often new and innovative approaches will be needed. There may be adaptation actions which reduce risk or provide benefits in a number of areas. For example, an area of land set aside to store excess water could reduce surface water flood risk, benefit biodiversity and help to manage water quality. Measures with multiple benefits can present an opportunity for different organisations to work together, sharing resources and expertise.

Listed below are some approaches and examples of innovative approaches to adaptation that achieve multiple benefits. They all show how measures to adapt can also improve the natural environment, and hence increase the resilience of ecosystems on which we all rely.

Sustainable Urban Drainage Systems (SUDS)

Sustainable Urban Drainage Systems are a variety of techniques which manage surface water runoff. SUDS techniques include permeable surfaces, filter drains, swales, soakaways and retention ponds. Their benefits can include:

- reducing flood risk
- minimising diffuse pollution
- maintaining or restoring natural flow regimes
- improving water resources
- enhancing local amenity and biodiversity.

[Find out more about Sustainable Urban Drainage Systems.](#)

Green roofs

Green roofs are partly or completely covered in plants. They can help to reduce vulnerability to climate change in several ways: they cool and insulate buildings; they provide habitat for wildlife and they reduce the risk of surface water flooding by retaining rain water. [Read more about green roofs.](#)

Land management – peat restoration

We have worked with partners including South West Water and Natural England to restore a large area of peat landscape on Exmoor and Dartmoor. Peat restoration addresses climate change risk in several important ways:

- It reduces flood risk elsewhere as peatland retains huge quantities of water during and after heavy rainfall.
- By slowing down run-off peatland prevents nutrients and organic matter from entering rivers and streams, which improves their water quality.
- It conserves and enhances this crucial habitat for upland wildlife.

In addition degraded peatland emits greenhouse gases, but when it is healthy acts as a valuable carbon store.

Coastal managed realignment

Climate change is expected to increase high tide levels in the Humber Estuary, leading to a greater risk of flooding for local people. [At Alkborough](#) we worked with partners to construct a breach in the existing estuary flood defences. During high tides this allows water from the estuary to flood an area that was previously agricultural land. This has two major benefits. Firstly it has created a huge new inter-tidal habitat, attracting more species of wildfowl and wading birds. Secondly it

reduces the flood risk to 300,000 people in the area by lowering high tide levels in the upper estuary.

Household water efficiency

Ashford in Kent is in a 'water-stressed' area but has also been identified as a location for large amounts of new housing. To adapt to current and future water scarcity homes in the area will have to use less water. We worked with partners including South East Water to improve water efficiency by offering a range of simple, low-cost devices. These included Save-a-Flush bags, which save a litre of water every time the toilet is flushed; a device which gives the option of a regular flush or half flush; and tap restrictors. Householders have also been given water efficiency advice. The project is monitoring the amount of water that is being saved through the use of these devices. Future work will look at fitting more devices to help save energy and water as part of a 'green neighbourhood' scheme.

Avoid damaging the natural environment

[Defra's Statutory Guidance to Reporting Authorities](#) makes clear that your responses to climate change must be sustainable, and that you should develop adaptation actions that avoid damage to the natural environment (see paragraphs 5.9 and 5.17-5.22). Our advice is that adaptation actions should aim to minimise the impacts and maximise the benefits to the natural environment.

In addition, most reporting authorities have statutory duties in relation to the Water Framework Directive and to designated ecological sites, and they should have regard to these objectives in the development of their reports. In developing your reports you will need to know the existing condition of water bodies (under WFD) and any affected designated sites

- > Learn about the existing pressures and risks
- > Reporting Authorities and the Water Framework Directive
- > Reporting Authorities and designated ecological sites
- > Reporting Authorities and environmental assessment

For information on broader pressures on the natural environment we suggest you contact [Natural England](#) or the [Countryside Council for Wales](#). Advice and data on species and habitats in the local environment can also be sought from local record centres. [Contact us to find the local record centre relevant to you.](#)

Existing pressures and risks

To develop sustainable adaptation options you will need to understand existing pressures and risks in your area. Wildlife and habitats in England and Wales are under pressure from many sources such as habitat loss, invasion of non-native species and pollution of ecosystems. Climate change poses an additional threat, and will exacerbate existing pressures. In developing your adaptation actions you should aim to avoid adding further burdens onto the environment and, wherever possible, work to reduce non-climate change pressures.

We can help you learn more about issues in the water environment. Environmental pressures and risks affect a large proportion of the rivers, lakes, groundwater and coastal waters in England and Wales. Problems include over-abstraction, pollution and the negative effects of physical modifications such as flood defences and shoreline reinforcement.

- Consult the [latest River Basin Management Plan](#) (annex G: “*Pressures and Risks*” and annex A: “*Current state of waters*”) to find out if such issues are threatening the water environment in your area.
- See our [drought plans for England and Wales](#) to locate designated conservation sites which are particularly dependent on water and vulnerable to drought.

Reporting Authorities and the Water Framework Directive

In exercising their functions all public bodies and statutory undertakers (i.e. most reporting authorities) have a duty to have regard to the objectives of the River Basin Management Plans or their supplementary plans. ([See section 17 of the Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2003](#)).

In developing adaptation plans you should be aware of the Water Framework Directive (WFD), in particular the requirement that nothing be done to a water body which would cause its condition (in WFD terminology - chemical status or ecological status) to deteriorate. The WFD only allows this requirement to be set aside where certain conditions are met. For example, where the social benefits of a project outweigh the environmental damage, and reasonable steps are taken to reduce the damage (article 4.7 of WFD).

Where an adaptation measure is likely to have adverse effects on the water environment, you could undertake an assessment of its impacts, taking particular account of water bodies or protected areas under the Water Framework Directive.

Reporting Authorities and designated ecological sites

You should verify whether your adaptation plans are likely to have an impact on designated ecological or conservation areas. This page helps you find out if a site is in such an area and what to do if this is the case.

All public bodies and statutory undertakers (i.e. all reporting authorities) have statutory duties to have regard to Sites of Special Scientific Interest, biodiversity conservation and designated landscapes in exercising their functions.⁶ Guidance on implementation of the biodiversity duty was issued by Defra in May 2007.⁷ Guidance on certain types of designated landscape was issued to all relevant authorities by Defra in 2005.⁸

Designated ecological or conservation areas.

See below for how to find out if a site is in a designated ecological or conservation area, and what to do if your adaptation measures are likely to have an impact on such an area.

Sites of Special Scientific Interest

Natural England (NE) or Countryside Council for Wales (CCW) should be formally notified of any works that may damage a SSSI. Contact the relevant area office prior to formal notification is encouraged.

See Natural England's map of English SSSIs : www.natureonthemap.org.uk

See a map of Wales SSSIs: www.ccw.gov.uk/interactive-maps/protected-sites-map.aspx

Special Areas of Conservation

SACs are protected under the EU Habitats Directive. Natural England/CCW should be formally notified of any works that may damage a SAC. Contact the relevant area office prior to formal notification is encouraged.

See Natural England's map of all SACs in England: www.natureonthemap.org.uk.

See a map of SACs in Wales: www.ccw.gov.uk/interactive-maps/protected-sites-map.aspx.

Special Protection Areas

SPAs are protected under the EU Birds Directive. A map of all UK SPA sites is available from the JNCC (www.JNCC.gov.uk). NE/CCW need to be consulted if your proposal is likely to have a significant affect on a site.

National Nature Reserves

National Nature Reserves are managed by different authorities. Advice should be sought from the relevant authority or from the NE/CCW area team. A map of all English National Nature Reserves is available from Natural England.

www.natureonthemap.org.uk. A map of Wales SSSIs is available from www.ccw.gov.uk/interactive-maps/protected-sites-map.aspx.

⁶ As introduced by Section 28G of the Wildlife and Countryside Act 1981, Section 40 of the Natural Environmental and Rural Communities Act 2006, Section 11A of the National Parks and Access to the Countryside Act 1949, Section 17A of the Norfolk and Suffolk Broads Act 1988 and Section 85 of the Countryside and Rights of Way Act 2000.

⁷ www.defra.gov.uk/environment/biodiversity/documents/pa-guid-english.pdf

⁸ www.defra.gov.uk/rural/documents/protected/npaonb-duties-guide.pdf

Local nature reserve

Local Nature Reserves are managed by different authorities, including local authorities. Advice should be sought from the relevant authority, or Local Records Centre. A map of all English Local Nature Reserves is available from Natural England www.natureonthemap.org.uk.

Areas Outstanding Natural Beauty

Compliance of the scheme with the objectives of landscape protection may need to be sought from the relevant authority. A map of Welsh AONBs is available from (www.ccw.gov.uk/interactive-maps/protected-sites-map.aspx). A list of English AONBs is available from Natural England.

National Parks

Each National Park is also a local planning authority. Approval of any scheme in a National Park will need their permission.

Conservation areas

Conservation areas are designated by local governments. Approval of the scheme by the local conservation officer may be required.

Protected species

A list of protected species can be found on Defra's website - www.defra.gov.uk/wildlife-countryside/index.htm.

For information on protected species in Wales visit - www.ccw.gov.uk/landscape--wildlife/habitats--species/species-protection.aspx.

Environmental Assessments for new developments or plans

If you are planning a new development likely to have a significant effect on the environment, you may be required to carry out an Environmental Impact Assessment (EIA). EIA should identify the environmental impacts of projects before those projects begin, and propose appropriate measures to address these impacts.

EIAs are a vital tool to help plan development in a way that safeguards the natural environment. EIA must also address climate change and can be used to take full account of climate change risks, and to develop adaptation measures for new developments.

As part of your climate change strategy, you could outline how you will use environmental assessments to assess and reduce climate change risks of new developments. If you have already completed EIAs, these may contain information useful for your adaptation report to Government.

As a result of previous EIAs you may have developed *Environmental Action Plans*, setting out the activities to be undertaken to mitigate the impacts identified for new developments. These plans may contain adaptation measures that you can highlight in your report to Government.

We have produced [Scoping Guidelines for the Environmental Impact Assessment of Projects](#), covering a wide range of developments. Although these do not address climate change specifically, they identify potential impacts of new developments, including those that may be linked to climate change, and may provide useful information on adaptation.

Strategic Environmental Assessments (SEAs)

SEAs require the environmental effects of *plans* and *programmes* to be identified and evaluated. SEAs must be undertaken by public bodies preparing plans and programmes for certain categories of activities, that set the framework for future development consent of projects. Other organisations may choose to undertake voluntary SEAs, to promote sustainable development.

The SEA process must consider the potential impacts of new plans and programmes on the environment, including on biodiversity, flora and fauna, and climate change. Whether or not your organisation is undertaking any SEAs currently, you may benefit from consulting our guidance on how to consider climate change issues for SEAs in England & Wales.

Strategic Environmental Assessment and climate change: Guidance for practitioners: www.environment-agency.gov.uk/research/policy/40121.aspx

Avoiding increasing flood risk elsewhere

Some types of adaptation measure could increase flood risk elsewhere. For example, a floodwall around a site could increase flood levels elsewhere by reducing the space for water. Or a new water storage pond could pose a flood risk if it overtopped during heavy rain.

Where appropriate, we recommend you appraise the potential impact of your adaptation measures on flood risk elsewhere. As part of this appraisal you could consider the following questions:

- How will you ensure that your adaptation measures (e.g. those to protect your site from flooding) will not increase flood risk elsewhere?
- If a measure is in the floodplain (as shown on our flood map), does it reduce the available floodplain area or block potential overland flood flow?
- Do you propose any alterations to existing flood defences or changes to the available access to flood defences for maintenance?
- Will a measure reduce the flood flow capacity of a river?
- Could the cumulative impact of the your proposals increase flood risk or adversely affect land drainage?

If the answer is yes to any of these questions you may want to consider alternative measures. If you do decide to go ahead you are likely to require formal written consent from us.

Read more about the roles and responsibilities of owning land or property near a river: [Living on the Edge](#).

FAQs on the Supplementary Guidance for Reporting Authorities

Why has EA developed this guidance?

We want to support the contribution that your reports can make towards preparing this country for changes in our climate. As one of the leading public bodies supporting climate change adaptation in England and Wales, we have a great deal of information and expertise that can help. We have developed this guidance to make this information available in a way that is simple to use for the purposes of completing your report.

Who is the guidance for?

The guidance is intended to help those organisations that the Government has directed or invited to report under the Adaptation Reporting Power. The guidance relates only to England and Wales.

What does the guidance cover?

It focuses on three important areas of climate change risk with which the Environment Agency has evidence and expertise: flooding, coastal change and water scarcity. Within these areas information set out according to the following structure:

- Step 1: Initial assessment of current risk
- Step 2: Screening assessment of future risk
- Step 3: Detailed assessment of your risks
- Step 4: Identifying adaptation options
- Step 5: Appraising adaptation options.

Why have you included information on current risks?

All the risks we discuss in our guidance are likely to increase with climate change. However you can make a start by managing current risk. That in itself will often be a valid initial adaptation measure.

What further help can you offer?

Throughout the guidance we indicate where we can provide further support. If this could be helpful you can [contact us](#). However, there are likely to be many areas of your report where we are unable to help. You should draw on a wide range of other sources, such as [some of those we recommend in this guidance](#).

Contacting us about the Reporting Power supplementary guidance

For more information about anything in the Adaptation Reporting Power guidance, contact our National Customer Contact Centre on

Telephone: 08708 506 506* (Mon-Fri, 8am - 6pm)

For the hard of hearing a **minicom service** is available by calling 08702 422 549*

Email: enquiries@environment-agency.gov.uk

When you make your enquiry please mention that it is in relation to the Adaptation Reporting Power guidance.

* Weekday Daytime calls to 0870 numbers cost 8p, plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary.