

The Wayback Machine - <http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-ris...>

**GOV.UK**

1. Home (<https://www.gov.uk/web/20210525145906/https://www.gov.uk/>)
2. Environment (<https://www.gov.uk/web/20210525145906/https://www.gov.uk/environment>)
3. Climate change and energy
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/environment/climate-change-energy>)
4. Climate change adaptation
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/environment/climate-change-adaptation>)

Guidance

Flood risk assessments: climate change allowances

When and how local planning authorities, developers and their agents should use climate change allowances in flood risk assessments.

From:

Environment Agency

(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/government/organisations/environment-agency>)

Published

19 February 2016

Last updated

22 July 2020 —

Applies to:

England

Contents

- What climate change allowances are
- When to use climate change allowances
- Exceptions – when it might be appropriate to use other data or allowances
- Types of allowances
- How to use a range of allowances to assess flood risk
- Get planning advice on your proposals
- Contact the Environment Agency

[Print this page](#)

This guidance is for:

- local planning authorities when they prepare strategic flood risk assessments
- developers and their agents when they prepare flood risk assessments for planning applications, and development consent orders for nationally significant infrastructure projects

Making allowances for climate change in your flood risk assessment will help minimise vulnerability and provide resilience to flooding and coastal change.

The Environment Agency will check that you have used climate change allowances when it provides advice on flood risk assessments and strategic flood risk assessments.

For guidance on designing flood and coastal risk projects, schemes and strategies see Flood and coastal risk projects, schemes and strategies: climate change allowances

(<http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances>).

For guidance on how the planning system will help minimise vulnerability and provide resilience to the impacts of climate change, see the:

- National Planning Policy Framework
(<http://web.archive.org/web/20210525145906/https://www.gov.uk/government/publications/national-planning-policy-framework--2>)
- planning practice guidance on flood risk and coastal change
(<http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-risk-and-coastal-change>)

Local planning authorities should refer to these when they prepare local plans and consider planning applications.

What climate change allowances are

Climate change allowances are predictions of anticipated change for:

- peak river flow
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

To increase resilience to flooding and coastal change, you should make allowances for climate change in your flood risk assessment.

There are allowances for different climate scenarios over different epochs, or periods of time, over the coming century. They include figures for extreme climate change scenarios, known as High++ (H+++) allowances.

When to use climate change allowances

The Environment Agency will use climate change allowances when they provide advice on flood risk assessments and strategic flood risk assessments.

Exceptions – when it might be appropriate to use other data or allowances

There may be circumstances where local evidence supports using other data or allowances. For example, the impact of climate change on peak river flow may not be the same in all river catchments in a river basin district.

The Environment Agency may want to check how and why you used other data in your plans and proposals.

Types of allowances

Peak river flow allowances

Peak river flow allowances show the anticipated changes to peak flow by river basin district.

The range of allowances in table 1 is based on percentiles. A percentile describes the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it, and half fall above it.

The:

- central allowance is based on the 50th percentile
- higher central allowance is based on the 70th percentile
- upper end allowance is based on the 90th percentile

An allowance based on the 50th percentile is exceeded by 50% of the projections in the range. At the 70th percentile it is exceeded by 30%. At the 90th percentile it is exceeded by 10%.

For these allowances it is important you do not use a single percentile out of context. For example, while the 50th percentile is the central estimate (the average), it does not represent the full range of likely futures. Using this percentile on its own may cause you to under-adapt to climate change.

Decide which peak river flow allowances to use for assessment

The Environment Agency uses the following data and standards as benchmarks for the advice it gives as a statutory consultee:

- peak river flow allowances in table 1 for flood risk assessments and strategic flood risk assessments
- flood risk vulnerability classification
(<http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>) for the type of development and flood zone over the lifetime of the proposed development, in development plan allocations for strategic flood risk assessments
- flood risk vulnerability classification
(<http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>) for the type of development and flood zone to decide which allowances to use – you should consider the lifetime of the proposed development to decide which future time period to use

The Environment Agency will want to see that you have considered applying the **highest** allowances in table 1, as well as the central, higher central and upper end allowances.

Table 1: peak river flow allowances by river basin district (based on a 1961 to 1990 baseline)

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)	
Northumbria	H++	20%	35%	65%	
	Upper end	20%	30%	50%	
	Higher central	15%	20%	25%	
	Central	10%	15%	20%	
Humber	H++	20%	35%	65%	
	Upper end	20%	30%	50%	
	Higher central	15%	20%	30%	
	Central	10%	15%	20%	
Anglian	H++	25%	40%	80%	
	Upper end	25%	35%	65%	
	Higher central	15%	20%	35%	
	Central	10%	15%	25%	
South east	H++	30%	60%	120%	
	Upper end	25%	50%	105%	
	Higher central	15%	30%	45%	
	Central	10%	20%	35%	
Thames	H++	25%	40%	80%	
	Upper end	25%	35%	70%	
	Higher central	15%	25%	35%	
	Central	10%	15%	25%	

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)	
South west	H++	25%	50%	105%	
	Upper end	25%	40%	85%	
	Higher central	20%	30%	40%	
	Central	10%	20%	30%	
Severn	H++	25%	45%	90%	
	Upper end	25%	40%	70%	
	Higher central	15%	25%	35%	
	Central	10%	20%	25%	
Dee	H++	20%	30%	60%	
	Upper end	20%	30%	45%	
	Higher central	15%	20%	25%	
	Central	10%	15%	20%	
North west	H++	25%	45%	95%	
	Upper end	20%	35%	70%	
	Higher central	20%	30%	35%	
	Central	15%	25%	30%	
Solway	H++	25%	45%	95%	
	Upper end	20%	30%	60%	
	Higher central	15%	25%	30%	
	Central	10%	20%	25%	

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)	
Tweed	H++	20%	35%	75%	
	Upper end	20%	25%	45%	
	Higher central	15%	20%	25%	
	Central	10%	15%	20%	

The following maps will help you find out which river basin district you are in:

- River basin district map
(<http://web.archive.org/web/20210525145906/https://www.gov.uk/government/publications/river-basin-district-map>)
- River basin district map that zooms in
(<http://web.archive.org/web/20210525145906/https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/WFDRiverBasinDistrictsCycle2&Mode=spatial>) so you can find places close to river basin district boundaries

Using peak river flow allowances for flood risk assessments

Consider the flood risk vulnerability classification

(<http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>) to decide which allowance applies to your development or plan. This will help you understand the range of impact. The central, higher central and upper end allowances are in table 1.

Also apply these allowances to developments and allocations where the strategic flood risk assessment shows an increased risk of flooding in the future. This includes locations that are currently in flood zone 1, but might be in flood zone 2 or 3 in the future.

In flood zones 2 or 3a for:

- essential infrastructure – use the upper end allowance
- highly vulnerable – use higher central and upper end allowances to assess a range of allowances (development should not be permitted in flood zone 3a)
- more vulnerable – use the higher central and upper end allowances to assess a range of allowances
- less vulnerable – use the central and higher central allowances to assess a range of allowances
- water compatible – use the central allowance

For less vulnerable development, use the higher central allowance as the basis for designing safe access, escape routes and places of refuge

(<http://web.archive.org/web/20210525145906/https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plan>). This will ensure the safety of people using the development.

In flood zone 3b for:

- essential infrastructure – use the upper end allowance
- highly vulnerable – development should not be permitted
- more vulnerable – development should not be permitted
- less vulnerable – development should not be permitted
- water compatible – use the central allowance

If development is appropriate even though it will not follow flood zone vulnerability categories, use the upper end allowance.

Floodplain storage compensation

The appropriate allowance to assess off-site impacts and calculate floodplain storage compensation depends on land uses in affected areas. In most cases use the higher central allowance to calculate floodplain storage compensation.

Use the upper end allowance to calculate floodplain storage compensation when the:

- catchment is particularly sensitive to small changes in volume, which could cause significant increases in flood depth or hazard
- affected area contains essential infrastructure or vulnerable uses, such as primary schools, caravans, bungalows or basement dwellings

Use the central allowance for floodplain storage compensation if you can demonstrate that the affected area contains only low vulnerability uses, such as water compatible development.

You should also consider likely future land uses shown by local plan allocations or unimplemented extant planning permissions. The Environment Agency will want to see evidence from the developer to prove this is the case.

Contact the Environment Agency if you are unsure which allowance to use for flood storage compensation.

Peak rainfall intensity allowance

Increased rainfall affects river levels and land and urban drainage systems.

How to use the peak rainfall intensity allowance

Table 2 shows anticipated changes in peak rainfall intensity in small catchments (less than 5km²), or urbanised drainage catchments. For large rural drainage catchments use the allowances in table 1.

For flood risk assessments and strategic flood risk assessments, assess both the central and upper end allowances to understand the range of impact.

Table 2: peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage catchments (based on a 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

Design your drainage system to make sure there is no increase in the rate of runoff discharged from the site for the upper end allowance.

Where on-site flooding for the upper end allowance presents a significant flood hazard (for example, where depths and velocities of surface water runoff cause a significant danger to people), you will need to take measures to protect people and property. This could include, for example, raising floor levels. As a minimum, there should be no significant flood hazard to people from on-site flooding for the central allowance.

Contact the Environment Agency if you are unsure about applying peak rainfall allowances in areas with critical drainage problems.

Contact your lead local flood authority (<http://web.archive.org/web/20210525145906/https://www.gov.uk/find-your-local-council>) (through your local council) if you are unsure about applying peak rainfall allowances in areas without critical drainage problems.

Sea level allowances

There are a range of allowances for each river basin district and epoch for sea level rise in table 3.

The range of allowances in table 3 is based on percentiles. A percentile describes the proportion of possible scenarios that fall below an allowance level.

The:

- higher central allowance is based on the 70th percentile
- upper end allowance is based on the 95th percentile

An allowance based on the 70th percentile is exceeded by 30% of the projections in the range. At the 95th percentile it is exceeded by 5% of the projections in the range.

For these allowances it is important you do not use a single percentile out of context. For example, while the 70th percentile is the higher central estimate, it does not represent the full range of likely futures. Using this percentile on its own may cause you to under-adapt to climate change.

For flood risk assessments and strategic flood risk assessments, assess both the higher central and upper end allowances to understand the range of impact.

The Environment Agency will want to see if you have considered whether it's appropriate to apply H₁ allowances for your flood risk assessment or strategic flood risk assessment. This is in addition to the sea level rise allowances in table 3.

Table 3: sea level allowances by river basin district for each epoch in mm per year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Anglian	Higher central	5.8 (203)	8.7 (261)	11.6 (348)	13 (390)	1.20
Anglian	Upper end	7 (245)	11.3 (339)	15.8 (474)	18.1 (543)	1.60
South east	Higher central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.20
South east	Upper end	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)	1.60
South west	Higher central	5.8 (203)	8.8 (264)	11.7 (351)	13.1 (393)	1.21
South west	Upper end	7 (245)	11.4 (342)	16 (480)	18.4 (552)	1.62
Northumbria	Higher central	4.6 (161)	7.5 (225)	10.1 (303)	11.2 (336)	1.03
Northumbria	Upper end	5.8 (203)	10 (300)	14.3 (429)	16.5 (495)	1.43
Humber	Higher central	5.5 (193)	8.4 (252)	11.1 (333)	12.4 (372)	1.15
Humber	Upper end	6.7 (235)	11 (330)	15.3 (459)	17.6 (528)	1.55
North west	Higher central	4.5 (158)	7.3 (219)	10 (300)	11.2 (336)	1.01
North west	Upper end	5.7 (200)	9.9 (297)	14.2 (426)	16.3 (489)	1.41

The following maps will help you find out which river basin district you are in:

- River basin district map
(<http://web.archive.org/web/20210525145906/https://www.gov.uk/government/publications/river-basin-district-map>)
- River basin district map that zooms in
(<http://web.archive.org/web/20210525145906/https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/WFDRiverBasinDistrictsCycle2&Mode=spatial>) so you can find places close to river basin district boundaries

For places in:

- Thames river basin district use ‘south east’ sea level rise allowances
- Severn river basin district use ‘south west’ sea level rise allowances
- parts of Solway Tweed river basin district on the west coast and Dee river basin district that are in England, use ‘north west’ sea level rise allowances
- parts of Solway Tweed river basin district on the east coast that are in England, use ‘Northumbria’ sea level rise allowances

The allowances in table 3 account for slow land movement. This is due to ‘glacial isostatic adjustment’ from the release of pressure at the end of the last ice age. The northern part of the UK is slowly rising and the southern part is slowly sinking. This is why net sea level rise is less for the north-west and north-east than the rest of the country.

To calculate sea level using table 3, add the allowances for the appropriate one of the 6 geographical areas:

- up to 2035, use the mm per year rates for the appropriate geographical area, starting from the present day extreme sea levels from Coastal design sea levels – coastal flood boundary extreme sea levels (2018)
(<http://web.archive.org/web/20210525145906/https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>)
- from 2036 to 2065, get the increase in sea level by adding the number of years on from 2035 (to 2065), multiplied by the respective rate shown in table 3 for the appropriate geographical area – if the whole time period applies use the cumulative total
- treat time periods 2066 to 2095 and 2096 to 2125 as you would 2036 to 2065

Where it is appropriate to apply H₁₀₀ allowances, use the single annual allowance in table 4. There is no H₁₀₀ value beyond 2100.

Table 4: H₁₀₀ sea level rise allowance

Change to relative mean sea level	Total sea level rise to 2100
H ₁₀₀ scenario	1.9 m

Coastal erosion

The Environment Agency expects sea level rise to increase the rate of coastal erosion. Use the coastal erosion risk maps
(<http://web.archive.org/web/20210525145906/https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=9cef4a084bbb4954b970cd35b099d94c>) to plan for any changes in the position of the coastline, together with any designated coastal change management areas and relevant policies in local plans.

Coastal erosion risk maps are based on the best available data. They show the shoreline management plan for each stretch of coast and erosion predictions where there is no policy to maintain defences.

Offshore wind speed and extreme wave height allowance

Wave heights may change because of:

- increased water depths
- changes to the frequency, duration and severity of storms

Environment Agency coastal models may already include wind speed and wave height allowance. Ask the Environment Agency if we have included wind speed and wave height allowance in your model.

The Environment Agency will want to see if you have used the appropriate allowance for wind speed and wave height in table 5 if these allowances are not included in your coastal model.

Use the epoch that the lifetime of your development falls into to choose the appropriate allowance. If your development lifetime is beyond 2056, use the allowance for the 2056 to 2125 epoch. The allowances are not cumulative across the epochs.

Use the sensitivity test allowances in addition to the offshore wind speed and extreme wave height allowances for assessments where the $H_{\pm\pm}$ allowances apply.

Table 5: offshore wind speed and extreme wave height allowance (based on a 1990 baseline)

Applies all around the English coast	2000 to 2055	2056 to 2125
Offshore wind speed allowance	5%	10%
Offshore wind speed sensitivity test	10%	10%
Extreme wave height allowance	5%	10%
Extreme wave height sensitivity test	10%	10%

Storm surge

The present day extreme sea levels in Coastal design sea levels – coastal flood boundary extreme sea levels (2018) (<http://web.archive.org/web/20210525145906/https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>) account for storm surge. Most Environment Agency coastal models use these extreme sea levels. Ask the Environment Agency when you get the model.

If your coastal model does not include an allowance for storm surge, or you are creating a new model, use the Coastal design sea levels – coastal flood boundary extreme sea levels (2018) (<http://web.archive.org/web/20210525145906/https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>) for your extreme sea levels. Then apply the climate change sea level rise values in table 3.

Where $H_{\pm\pm}$ allowances apply, add 2mm per year starting from 2017.

Using $H_{\pm\pm}$ allowances for nationally significant infrastructure projects, new settlements or urban extensions

Nationally significant infrastructure projects (NSIPs) are major infrastructure projects such as new harbours, roads, power stations and power lines. If you develop NSIPs you may need to assess the flood risk from a credible maximum climate change scenario. Check the relevant national policy statement.

In other cases, such as new settlements or significant urban extensions, you may also need to assess the flood risk from a high impact climate change scenario. In these circumstances you should use the H₁₀₀ climate change allowances.

You should treat this as a 'sensitivity test'. It will help you assess how sensitive your proposal is to changes in the climate for different future scenarios. This will ensure your development can be adapted to large-scale climate change over its lifetime.

How to use a range of allowances to assess flood risk

To help you decide which allowances to use to address flood risk for a development or development plan allocation, consider the:

- likely depth, extent, speed of onset, velocity and duration of flooding for each allowance of climate change over time
- vulnerability of the proposed development types or land use allocations to flooding
- 'built in' measures used to address flood risk, for example, raised floor levels
- capacity or space in the development to include measures to manage flood risk in the future, using an adaptive approach

Adaptive approach

Some measures to manage flood risk are not necessary now but may be in the future. For example, setting a development away from a river so it's easier to improve flood defences in the future. This is called an adaptive approach.

The Environment Agency will consider whether an adaptive approach is appropriate when they review your plans or proposals.

Get planning advice on your proposals

The Environment Agency can give a free preliminary opinion (<http://web.archive.org/web/20210525145906/https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>) to applicants who consult us on their proposals outside the statutory consultation process. This will include advice on what allowances to apply and the appropriate approach to incorporating the allowances into assessments.

There is a charge for more detailed pre-application planning advice and reviews of flood risk modelling.

Contact your lead local flood authority (<http://web.archive.org/web/20210525145906/https://www.gov.uk/find-your-local-council>) (through your local council) for advice on flood risk from local watercourses, surface or groundwater.

Contact the Environment Agency

General enquiries

National Customer Contact Centre
PO Box 544
Rotherham
S60 1BY

Email enquiries@environment-agency.gov.uk

(<http://web.archive.org/web/20210525145906/mailto:enquiries@environment-agency.gov.uk>)

Telephone 03708 506 506

Telephone from outside the UK (Monday to Friday, 8am to 6pm GMT) +44 (0) 114 282 5312

Monday to Friday, 8am to 6pm.

Due to the current health emergency we have reduced the times our phone lines are open. This is under review and we hope to be able to extend them soon. If possible please contact us by email at enquiries@environment-agency.gov.uk

(<http://web.archive.org/web/20210525145906/mailto:enquiries@environment-agency.gov.uk>).

The impact of COVID-19 on our teams means you may experience some delays in responses as most of our staff will be working from home. We are currently unable to deal with post sent to our offices in the usual way.

Published 19 February 2016

Last updated 22 July 2020 + show all updates

1. 22 July 2020

We have edited the sections on peak river flow, sea level rise, wind speed, wave height and storm surge to include guidance on how to use High ++ allowances in developments where they need to be assessed.

2. 16 March 2020

Correction to example 3, to get sea levels: treat subsequent time periods 2066 to 2095 and 2096 to 2125 as you would 2036 to 2065.

3. 17 December 2019

We have made the following updates: 1) Updated the sea level rise allowances using UKCP18 projections. 2) Added guidance on how to a) calculate flood storage compensation, b) use peak rainfall allowances to help design drainage systems, c) account for the impact of climate change on storm surge, d) assess and design access and escape routes for less vulnerable development. 3) Changed the guidance on how to apply peak river flow allowances so the approach is the same for both flood zones 2 and 3.

4. 15 February 2019

Added: This guidance is being revised in line with the UK Climate Projections 2018. Please contact the Environment Agency for interim guidance if you are preparing a flood risk assessment for a development or local plan affected by tidal flooding.

5. 3 February 2017

Temporary exceptions sections removed and information for flood zone 1 added

6. 12 April 2016

Epochs in tables 2,3 and 4 updated.

7. 19 February 2016

First published.

[Print this page](#)

Related content

- River basin district map
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/government/publications/river-basin-district-map>)
- Flood and coastal risk projects, schemes and strategies: climate change allowances
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances>)
- Flood risk and coastal change
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/guidance/flood-risk-and-coastal-change>)
- Flood risk assessment in flood zones 2 and 3
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zones-2-and-3>)
- Review individual flood risk assessments: standing advice for local planning authorities
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>)

Collection

- Environment Agency and climate change adaptation
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/government/collections/environment-agency-and-climate-change-adaptation>)

Brexit

Check what you need to do (<https://www.gov.uk/web/20210525145906/https://www.gov.uk/transition>)

Explore the topic

- Climate change adaptation
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/environment/climate-change-adaptation>)
- River maintenance, flooding and coastal erosion
(<https://www.gov.uk/web/20210525145906/https://www.gov.uk/environment/river-maintenance-flooding-coastal-erosion>)