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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 \(/government/organisations/environment-agency\)](/government/organisations/environment-agency)

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This guidance is for:

- local planning authorities preparing strategic flood risk assessments
- developers and their agents preparing 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 they provide 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](https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances) (<https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances>).

For guidance on how to prepare a site-specific flood risk assessment see [Flood risk assessments if you're applying for planning permission](https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications) (<https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>).

For guidance on strategic flood risk assessments see [How to prepare a strategic flood risk assessment](https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) (<https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment>).

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](https://www.gov.uk/government/publications/national-planning-policy-framework--2) (<https://www.gov.uk/government/publications/national-planning-policy-framework--2>)
- [planning practice guidance on flood risk and coastal change](https://www.gov.uk/guidance/flood-risk-and-coastal-change) (<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.

When to use climate change allowances

The Environment Agency uses 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 for all rivers in a management catchment.

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

Peak river flow allowances

Peak river flow allowances show the anticipated changes to peak flow by management catchment. Management catchments are sub-catchments of river basin districts.

The range of allowances 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 flow 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 95th 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 95th percentile it is exceeded by 5%.

Select the peak river flow allowances to use for your assessment

For flood risk assessments and strategic flood risk assessments, the Environment Agency, as a statutory consultee, uses the management catchment climate change allowances from the [peak river flow map](https://environment.data.gov.uk/hydrology/climate-change-allowances) (<https://environment.data.gov.uk/hydrology/climate-change-allowances>) as benchmarks.

To work out which management catchment allowances to use, you need to:

- access the climate change allowances for [peak river flow map](https://environment.data.gov.uk/hydrology/climate-change-allowances) (<https://environment.data.gov.uk/hydrology/climate-change-allowances>)
- search for your location by postcode, national grid reference or town in the 'find address or place' search box
- select the management catchment for your location – the allowances appear in a pop-up box

In some locations the dominant source of flooding will be from a neighbouring management catchment. If so, use the allowances from the neighbouring management catchment to assess the risk for your development or site allocation. [Contact the Environment Agency](#) if you are unsure which allowance to use.

The Environment Agency also provide these allowances in the [peak river flow climate change allowances by management catchment](https://www.gov.uk/government/publications/peak-river-flow-climate-change-allowances-by-management-catchment) (<https://www.gov.uk/government/publications/peak-river-flow-climate-change-allowances-by-management-catchment>) table – you have to know your management catchment to get the information you need.

You also need to know the flood zone your development is located in.

Using peak river flow allowances for flood risk assessments

Use the [flood risk vulnerability classification](https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification) (<https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>) to classify the vulnerability of your development.

Assess both the central and higher central allowances for strategic flood risk assessments.

In flood zones 2 or 3a for:

- essential infrastructure – use the higher central allowance
- highly vulnerable – use central allowance (development should not be permitted in flood zone 3a)
- more vulnerable – use the central allowance
- less vulnerable – use the central allowance
- water compatible – use the central allowance

In flood zone 3b for:

- essential infrastructure – use the higher central 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

Apply the peak river flow 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.

To ensure the safety of people using the development when designing [safe access, escape routes and places of refuge](https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plan) (<https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plan>), use the central allowance for all development types except for essential infrastructure. Use the higher central allowance for this.

If the local planning authority consider the development is appropriate, even though it will not follow the [flood zone compatibility categories](https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability) (<https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability>) for flood zones 2, 3a or 3b, use the higher central allowance.

Where it is appropriate to apply a [credible maximum scenario](#), use the upper end allowance.

Assess off-site impacts and calculate floodplain storage compensation

The appropriate allowance to assess off-site impacts and calculate floodplain storage compensation depends on land uses in affected areas. Use the:

- central allowance for most cases
- higher central allowance when the affected area contains essential infrastructure

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 they have done this.

[Contact the Environment Agency](#) if you are unsure which allowance to use for flood storage compensation.

Peak rainfall intensity allowance

Increased rainfall affects surface water flood risk and how you need to design drainage systems.

How to use the peak rainfall intensity allowances

The [peak rainfall allowances map](https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall) (<https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall>) shows anticipated changes in peak rainfall intensity. Use these for site-scale applications (for example, drainage design), and for surface water flood mapping in small catchments (less than 5 square kilometres) and urbanised drainage catchments. A drainage catchment is urban if the land use is a town or city. If you are unsure if your catchment is urban or rural, please contact the [lead local flood authority](https://www.gov.uk/find-your-local-council) (<https://www.gov.uk/find-your-local-council>).

For modelling large areas (larger than 5 square kilometres) with rural land use, direct rainfall modelling is unlikely to be appropriate and fluvial flood risk should be assessed using the [peak river flow allowances](#). Do not use the peak river flow allowances to adjust rainfall totals as they are not compatible.

To work out which management catchment allowances to use, you need to:

- access the climate change allowances for [peak rainfall allowances map](https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall) (<https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall>)
- search for your location by postcode, national grid reference or town in the 'find address or place' search box
- select the management catchment for your location – the allowances appear in a pop-up box

The Environment Agency also provides the peak rainfall allowances in the table [Peak rainfall climate change allowances by management catchment](https://www.gov.uk/government/publications/peak-rainfall-climate-change-allowances-by-management-catchment) (<https://www.gov.uk/government/publications/peak-rainfall-climate-change-allowances-by-management-catchment>). You have to know your management catchment to find the information you need.

Using peak rainfall intensity allowances to assess surface water flood risk

Use the development lifetime guidance to work out the lifetime of your development. You should consider residential development to have a minimum lifetime of a 100 years.

Development with a lifetime beyond 2100

This includes development proposed in applications or local plan allocations.

For flood risk assessments and strategic flood risk assessments assess the upper end allowances. You must do this for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125).

Design your development so that for the upper end allowance in the 1% annual exceedance probability event:

- there is no increase in flood risk elsewhere
- your development will be safe from surface water flooding

Follow this guidance to help you do this:

- [Planning practice guidance on flood risk](https://www.gov.uk/guidance/flood-risk-and-coastal-change#planning-and-flood-risk) (<https://www.gov.uk/guidance/flood-risk-and-coastal-change#planning-and-flood-risk>)
- [Preparing a flood risk assessment: standing advice – Surface water management section](https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#standing-advice-for-vulnerable-developments) (<https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#standing-advice-for-vulnerable-developments>)

- [Sustainable drainage systems: non-statutory technical standards](https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards) (<https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>)
- [CIRIA SuDS manual](https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/update-to-the-suds-manual) (<https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/update-to-the-suds-manual>)
- Water UK [sewerage sector guidance – Design and construction standards](https://www.water.org.uk/wp-content/uploads/2021/07/SSG-App-C-Des-Con-Guide.pdf) (<https://www.water.org.uk/wp-content/uploads/2021/07/SSG-App-C-Des-Con-Guide.pdf>)
- [ICE SuDS route maps](https://myice.ice.org.uk/knowledge-and-resources/best-practice/sustainable-drainage-systems) (<https://myice.ice.org.uk/knowledge-and-resources/best-practice/sustainable-drainage-systems>)

Development with a lifetime of between 2061 and 2100

For development with a lifetime between 2061 and 2100 take the same approach but use the central allowance for the 2070s epoch (2061 to 2125).

Development with a lifetime up to 2060

For development with a lifetime up to 2060, take the same approach but use the central allowance for the 2050s epoch (2022 to 2060).

Contact the [lead local flood authority](https://www.gov.uk/find-local-council) (<https://www.gov.uk/find-local-council>) if you are unsure which allowance to use.

Exceptions

In some locations the allowance for the 2050s epoch is higher than that for the 2070s epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances.

Sea level allowances

There are a range of allowances for each [river basin district](#) and epoch for sea level rise. They are set out in [table 1](#) and are 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 flood risk assessments and strategic flood risk assessments, assess both the higher central and upper end allowances.

The Environment Agency will want to see if you have considered whether it is appropriate to apply the [H++ allowances](https://www.gov.uk/government/publications/flood-risk-assessments-river-basin-district-maps) for your flood risk assessment or strategic flood risk assessment. Where applicable you should do H++ allowance assessments as well as assessing the sea level rise allowances in table 1.

Table 1: sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets

Area of England (https://www.gov.uk/government/publications/flood-risk-assessments-river-basin-district-maps)	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2100 (mm)
Anglian	Higher central	5.8 (203)	8.7 (261)	2.5 (313)
Anglian	Upper end	7 (245)	11.3 (339)	4.4 (400)
South east	Higher central	5.7 (200)	8.7 (261)	2.5 (313)
South east	Upper end	6.9 (242)	11.3 (339)	4.4 (400)
South west	Higher central	5.8 (203)	8.8 (264)	2.5 (313)
South west	Upper end	7 (245)	11.4 (342)	4.4 (400)
Northumbria	Higher central	4.6 (161)	7.5 (225)	2.5 (290)
Northumbria	Upper end	5.8 (203)	10 (300)	4.4 (400)
Humber	Higher central	5.5 (193)	8.4 (252)	2.5 (313)
Humber	Upper end	6.7 (235)	11 (330)	4.4 (400)
North west	Higher central	4.5 (158)	7.3 (219)	2.5 (290)

Area of England (https://www.gov.uk/government/publications/flood-risk-assessments-river-basin-district-maps)	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2 2 (1
North west	Upper end	5.7 (200)	9.9 (297)	(4

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

- [River basin district map \(https://www.gov.uk/government/publications/river-basin-district-map\)](https://www.gov.uk/government/publications/river-basin-district-map)
- [River basin district map that zooms in \(https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/WFDRiverBasinDistrictsCycle2&Mode=spatial\)](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 1](#) 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 1, add the allowances for the appropriate one of the 6 geographical areas:

- up to 2035, use the mm for each 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 \(2018\)](https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018) (<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 1](#) 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 a [credible maximum scenario](#), use the H++ allowance. There is no H++ value for sea level rise beyond 2100.

H++ sea level rise allowance

For the change to relative mean sea level use the H++ scenario of 1.9m for the total sea level rise to 2100.

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

Coastal erosion

The Environment Agency expects sea level rise to increase the rate of coastal erosion. Use the [coastal erosion risk maps](#) (<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 they 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 2 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 it is appropriate to apply a [credible maximum scenario](#).

Table 2: 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 \(2018\)](https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018) (<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 \(2018\)](https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018) (<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 1](#).

Where it is appropriate to assess a credible maximum scenario, add 2mm for each year starting from 2017.

Assessing credible maximum scenarios 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 H++ climate change allowances for sea level rise
- the upper end allowance for peak river flow
- the sensitivity test allowances for offshore wind speed and extreme wave height
- an additional 2mm for each year on top of sea level rise allowances from 2017 for storm surge

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 help to ensure your development can be adapted to large-scale climate change over its lifetime.

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 is 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](https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion) (<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](https://www.gov.uk/find-your-local-council) (<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

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