

Flood risk assessment: climate change allowances – Environment Agency guidance



Ian Small and Andrew Heath Brown, AECOM, discuss the new climate change allowances and the impact on flood risk assessments.

New Government requirements on climate change will impact your development approvals and design

The Environment Agency (EA) has updated the climate change advice to be used in all relevant projects including flood risk assessments for all forms of development in England. The guidance has been updated in line with the best available scientific evidence. This will help ensure new housing and other developments remain safe and resilient to flooding, without increasing flood risk elsewhere. The main changes have been to peak river flows and peak rainfall intensity, to reflect the scale of impact in different geographical locations and the inherent uncertainty in climate change projections.

The changes support the National Planning Policy Framework (NPPF)ⁱ and have been produced by the EA as the government's expert on flood risk. These changes are effective now (implemented from the 19th February 2016).

Development requirements and climate change allowances

The new guidelines need to be considered when preparing new flood risk assessments (FRAs), and all stakeholders should be aware that planning applications will be scrutinised as such. The climate change allowances are predictions of anticipated change for:

- Peak river flow (by river basin district);
- Peak rainfall intensity;
- Sea level rise;
- Offshore wind speed and extreme wave height.

What is the impact for new developments?

New developments must be compliant with the NPPF and associated technical guidance, including the National Planning Policy Guidance (NPPG)ⁱⁱ. Therefore developers and designers must ensure their proposals appropriately assess and take account of the implications of climate change on flood risk (both on-site and off-site).

The published data available from the EA is unlikely to account for the revised climate change allowances. Additional model scenario runs using the climate change allowances will be necessary until the data is updated. The EA uses the climate change allowances in 'Flood risk assessments: climate change allowances'ⁱⁱⁱ as the benchmark for the advice it gives as a statutory consultee in the planning process. Therefore it is important that developers' FRAs take account of the climate change allowances as set out in the guidance. This could require detailed modelling to be undertaken. In some cases however, it may be acceptable to provide resilience without detailed investigations. For those applications where the EA are a statutory consultee, this should be agreed and specialist consultants can assist developers with this process.

For the inclusion of SuDS within a development, designers will need to consider the potential increase in peak rainfall intensity for the capacity of the system and also the exceedance flows for extreme events. The new guidance also defines increases in peak rainfall intensity for different epochs and percentiles (i.e. central and upper end allowances). Designers will therefore need to select the appropriate allowances based on the type of development proposed and the required lifespan of the infrastructure.

When will developers need to apply the new guidelines?

The advice came into effect as of 19th February 2016 and all new developments will need to comply. Transitional measures were put in place but they are no longer expected to be required.

How is climate change accounted for under the new guidelines?

The new guidelines are based on joint Defra and EA research of UKCP09^{iv} datasets to produce more representative allowances across England. In comparison to the existing recommendations previously used for FRAs for developments there are potentially significant changes to the peak river flow allowances for most of the River Basin Districts (previously there was a blanket recommended increase of 20%). The rainfall intensity allowance has also changed in relation to guidance for developments. It is now presented as a range (between 20% and 40%) based on the central and upper estimate. There have been no changes to the allowances for wind speed, wave height, storm surge, mean sea level.

Peak flows (rivers and watercourses)

Previously, the impact of climate change on peak river flows was assessed based on a 20% increase applied across England. However, the new guidelines require consideration of a number of factors to determine the required increase in peak flow that will need to be considered: (i) River Basin District (ii) Allowance Category and (iii) Epoch. This is to ensure that climate change risk is applied consistently across England and reducing the risk of over or under engineered solutions.

The map shows the river basin districts in England (and parts of Wales) that are considered in the new climate change allowances^v.



To determine the appropriate increase for a development the following steps are required:

1. Identify the River Basin District the development is within.
2. Using the vulnerability classification for the development determine the Allowance Category to apply. This will be either central, higher central, upper end or none.
3. Based on the expected lifetime of the development the suitable epoch of allowances can be applied.

The range of allowances for peak river flows is displayed as percentiles. Table 1 provides an example of peak river flow allowances for the **Northumbria** river basin district. Allowances for other river basin districts are included in the EA guidance.

The allowances for each river basin district are based on current scientific research and data. However, there is still uncertainty in future climate change projections; hence the allowances for each river basin district are provided as a range. For further information on how the probabilities are determined and what they mean the [UKCP09 website](http://www.ukcp09.org) provides a detailed explanation.

Allowance category	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Upper End	20%	30%	50%
Higher Central	15%	20%	25%
Central	10%	15%	20%

Table 1: Peak river flow allowances for the *Northumbria* river basin district (use 1961 to 1990 baseline)^{vi}

Flood Zones	Flood risk vulnerability classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 2	Higher central and Upper	Higher central and Upper	Central and Higher central	Central	None
Zone 3a	Upper	X	Higher central and Upper	Central and Higher central	Central
Zone 3b	Upper	X	X	X	Central

Table 2: Guidance on what allowances to assess for different vulnerability classifications and Flood Zone^{vii}

The allowance required for a particular FRA is determined by the vulnerability classification of the development. The peak river flow allowance(s) to assess for each category is summarised in Table 2. The general principle of the approach is to take a less precautionary approach in areas of lower flood risk and for developments with lower vulnerability to flooding. Further details on the vulnerability classification can be found in the [Planning Practice Guidance](#).

If (exceptionally) development is proposed in Flood Zones and vulnerability categories against planning policy (those marked as X in Table 2) then it would be appropriate to use the upper end allowance in preparing the proposal for consideration.

Summary

In summary to identify which allowances apply to your development, take the following steps:

1. Work out which river basin district you are in so you know which river basin district allowances apply.
2. Identify which vulnerability classification your development is and which flood zone it is in. Based on the guidance, this will tell you whether central, higher central, upper end or none of the allowances apply.

3. Work out the lifetime of the development so you know which epoch of allowances to apply.

Planning practice guidance helps you work out the vulnerability classification and the lifetime of the development. The EA flood map for planning tells you what your current flood zone is.

In some cases the above process will direct you to assess a range of allowances. For example, for a residential development in central London in flood zone 2:

- The Thames River Basin District allowances will apply
- Residential development is 'more vulnerable' in the flood risk vulnerability classification. For this classification of development in flood zone 2, the 'central' and 'higher central' allowances apply.
- Residential has a lifetime of 100 years, thus the 2080s epoch applies.
- This means allowances of 25% and 35% increase in peak flow should be assessed in the FRA.

If a development is highly sensitive to flooding (e.g. major infrastructure projects or developments that significantly change existing settlement patterns), the guidance recommends you should consider if H++ scenarios need to be assessed (see the guidance for further details).

What does this mean for a development?

- Flood plain extents will likely increase, theoretically reducing developable land.
- The scale of changes will vary across the country.
- More creative combined land uses will need to be considered.
- Flood Risk Assessments will have to consider a range of scenarios dependent on development type, flood risk vulnerability classification, and development lifetime.
- Specialist advice and guidance on the appropriate allowance categories for any development being assessed should be obtained.
- The EA and Local Planning Authority should be engaged early.
- In the shorter term EA flood maps are unlikely to show updated climate change extents, meaning new runs will probably be required.

Peak rainfall intensity

The new guidance presents anticipated changes in extreme rainfall intensity within small and urban catchments. There are two allowance categories across three epochs, but for FRAs and Strategic Flood Risk Assessments both allowance categories must be assessed to understand the range of impact. The greater intensity events are required to check that flood risk is not increased on or off

site when the drainage capacity has been exceeded.

There is no geographical consideration in respect of peak rainfall intensity. Table 3 provides the rainfall uplift percentages for small (less than 5km²) and urban catchments. It should be noted that the Lead Local Flood Authority may require a slightly different approach depending on local circumstances and these should be agreed directly with them up front.

Allowance category	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

Table 3: Peak rainfall intensity allowances in small and urban catchments (use 1961 to 1990 baseline)^{viii}

What does this mean for a development?

- Development drainage designs (including SuDS) should be evaluated for a range of rainfall intensities depending on the lifetime of the development.
- Infiltration rates and runoff constraints will likely result in increased on-site storage requirements.
- Short term nuisance flooding of highways, public open space and public realm areas should be considered (supported by appropriate 2D modelling of the development).
- The design of drainage systems should not increase flood risk on or off site for any scenario

Sea level allowances

For developments that are likely to be affected by tidal flooding, it will be necessary to provide

allowance for sea level rise. The new guidelines present both a rate of rise per year and a total rise for four potential change bands, which enable the developer to provide appropriate mitigation

against the anticipated sea level rise (based on the lifetime of the development).

Table 4 provides an example of these rises for the South West of England. The guidelines also present rises for the North West and North East regions (as one category), and for the East, East

Midlands, London and South East (as another category).

In parallel with this, the EA expect sea level rise to increase the rate of coastal erosion, and as such, coastal erosion risk mapping would need to be consulted in order to plan for any expected changes in the position of the coastline.

Area of England	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative rise 1990 to 2115
South West	3.5 (122.5mm)	8 (240mm)	11.5 (345mm)	14.5 (435mm)	1.14m

Table 4: Sea level allowance for each potential change band in millimetres (mm) per year with cumulative sea level rise for each potential change band in brackets (use 1990 baseline)^{ix}

Offshore wind speed and extreme wave height allowance

The wind speed and wave height allowances have not changed from previous planning guidance ‘climate change allowances for planners’, except for the addition of an extra sensitivity allowances. Wave heights may change because of increased water depths resulting from climate change. The frequency, duration and severity of storms could also change. For developments that could be affected by such factors, the EA will expect

consideration of the impact as part of the development proposals. This will involve both a single allowance for each epoch for wind speed and wave height, as shown in Table 5, and an analogous 10% sensitivity allowance to understand the range of impact. There is no geographical consideration in respect of offshore wind speed and extreme wave height allowance. Examples of development affected by these allowances would be offshore structures and coastal developments in exposed locations.

Allowance category	1990 to 2050	2051 to 2115
Offshore wind speed	+5%	+10%
Extreme wave height	+5%	+10%

Table 5: Offshore wind speed and extreme wave height allowance (use 1990 baseline)^x

What does this mean for a development?

- Development in exposed and/or unprotected coastal and tidal areas and offshore structures will need to be resilient to increased sea levels and wave heights (e.g. appropriate finished floor levels, wave protection, access/egress arrangements).
- Water compatible coastal development will likely be affected most.

High++ Allowances

The guidance refers to a the ‘High++’ scenario will need to be considered in particular circumstances, and are only required for peak river flow and mean sea level. The high++ allowances will only apply in assessments for developments that are very sensitive to flood risk and with lifetimes beyond the end of the century. For example, infrastructure

projects or developments that significantly changes existing settlement patterns. This includes urban extensions and new settlements. H++ allowances are provided in EA guidance ‘[Adapting to climate change: guidance for flood and coastal risk management authorities](#)^{xi}. Engagement with the EA will be necessary for any project expecting to meet these criteria.

Further Information

Guidance on Government Website:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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- ⁱ Department for Communities & Local Government. (2012), Planning Practice Guidance. [National Planning Policy Framework](#). London, GOV.UK
- ⁱⁱ Department for Communities & Local Government. (2012), Planning Practice Guidance. (2015). [Flood Risk and Coastal Change](#). London, GOV.UK
- ⁱⁱⁱ Environment Agency. (2016). [Flood risk assessments: climate change allowances](#). London. GOV.UK
- ^{iv} UK Climate Projections. (2014). [Probability in the UKCP09 projections](#). London. Met Office
- ^v Environment Agency. (2016) [Flood risk assessments: river basin district maps](#). London. GOV.UK
- ^{vi} Environment Agency. (2016). [Flood risk assessments: climate change allowances](#). London. GOV.UK. Table 1
- ^{vii} Department of Communities & Local Government. (2014 and following). [Flood Zone and Flood Risk Tables: Table 2: Flood Risk Vulnerability Classification](#). London. GOV.UK
- ^{viii} Environment Agency. (2016). [Flood risk assessments: climate change allowances](#). London. GOV.UK. Table 2
- ^{ix} Environment Agency. (2016). [Flood risk assessments: climate change allowances](#). London. GOV.UK. Table 3
- ^x Environment Agency. (2016). [Flood risk assessments: climate change allowances](#). London. GOV.UK. Table 4
- ^{xi} Environment Agency. (2016) [Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities](#). London, Environment Agency