

Sector Perspective

- In the UK today, around 6 million properties (or one in six of all properties) are exposed to some degree of flood risk, with around 560,000 properties exposed to significant likelihood of river and tidal flooding¹ in England and Wales alone.
- On average, annual damage to properties and their contents due to river and tidal flooding in the UK currently totals around £1.3 billion. The cost of extreme flooding events, however, can be much higher: for example, the widespread flooding in summer 2007 which affected England, Wales and Northern Ireland was estimated to cost more than £3 billion in England alone.
- Climate change may result in more flooding, due to higher river flows (caused in particular by an increase in the quantity and intensity of winter rainfall) and rising sea levels. The frequency of river flooding may double or quadruple by the 2080s. Rising sea levels may accelerate coastal erosion and the deterioration of coastal flood defences. Changes in rainfall patterns may also increase the risk of surface water flooding, although suitable information is not currently available for analysing this in detail.
- In addition to the increase in flood risk to existing properties and infrastructure, it is projected that the overall increase in flood risk could be substantially greater if new development occurs in the floodplain at the same rate as elsewhere, based on projected population growth and the number of homes and other buildings that would be constructed in floodplains.
- In Scotland, Wales and Northern Ireland, responsibility for flood and coastal erosion risk management policy has been devolved to the respective Devolved Administrations. In England, the responsibility rests with the Department for Environment, Food and Rural Affairs (Defra).
- This sector is generally well-prepared for the need to adapt to climate change. However, its interdependencies with other sectors (e.g. built environment, agriculture and biodiversity and ecosystem services) may make its risk profile more complex to manage. In particular, the knock-on effects of adaptive actions may be hard to predict.

¹ Significant likelihood is defined as having an annual chance of flooding (to any depth) greater than 1 in 75.



Floods and Coastal Erosion

Climate change is projected to result in changes to rainfall patterns and in sea levels, as detailed in the UK Climate Projections published by Defra in 2009 (UKCP09). These may exacerbate the existing risks posed by flooding and coastal erosion, in terms of direct physical damage and also disruption to people's lives and businesses.

The Climate Change Risk Assessment (CCRA) has completed an assessment of a range of impacts for which this sector may need to prepare. Some of the key points from this assessment are summarised here. Information on other sources of flooding (particularly surface water) and flooding in Scotland and Northern Ireland is being collected and will be used in future cycles of the CCRA, due every five years.

Unless otherwise stated, the results presented do not take account of changes in society (e.g. population growth, economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans).

The assessment of flood risk for the CCRA has assumed that there are no changes in existing flood and coastal erosion risk management measures; the analysis takes account of current flood defences and protection against coastal erosion, but does not include any future changes as a result of adaptation policies or deterioration of existing flood defences and coastal protection measures. The figures here apply to river and tidal flooding in England and Wales only.

Focus on... People

The potential social impacts of flooding and coastal erosion are substantial. As well as the immediate physical and mental effects, the resettling of those affected can be disruptive and traumatic. In future, the impacts of flooding and coastal erosion may be felt by an increasing number of people, with the consequences felt disproportionately by vulnerable groups, such as the elderly, the long-term sick and the economically disadvantaged.

Confidence

H People exposed to significant likelihood of flooding (taking population growth into account): between 1.3 million and 3.6 million by the 2050s, rising to between 1.7 million and 5 million by the 2080s (an increase of between 400,000 and 2.7 million by the 2050s and between 800,000 and 4.1 million by the 2080s compared to the current figure of 900,000).

M Residential properties that are located in the most deprived areas and exposed to significant likelihood of flooding (taking population growth into account): between 170,000 and 560,000 by the 2080s (an increase of between 100,000 and 490,000 compared to the current figure of 70,000).

M Increase in people affected by flood-related mental stress each year: between 3000 and 4000 by the 2020s, between 4000 and 7000 by the 2050s and between 5000 and 8000 by the 2080s (current figure for total number of people affected each year: between 3500 and 4500).

Focus on... Property

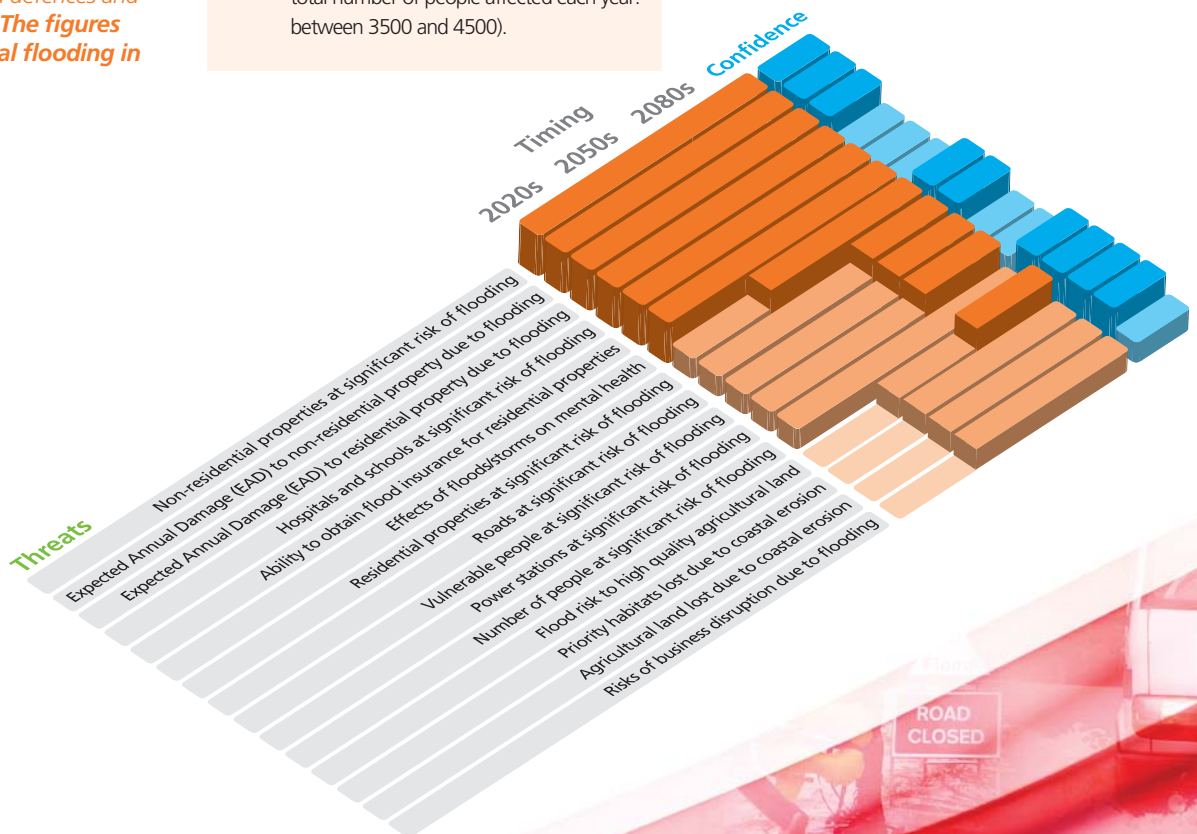
A growing number of residential and non-residential properties may become liable to flooding during the course of the 21st Century. This may have a large economic impact and may lead to a substantial rise in insurance payouts for flood damage.

Confidence

H Properties with a significant likelihood of flooding: between 770,000 and 1.3 million by the 2050s, rising to between 980,000 and 1.5 million by the 2080s (current figure: around 560,000).

H Annual damage to properties due to flooding: between £1.7 and £4.5 billion by the 2050s, rising to between £2.1 and £6.2 billion by the 2080s (current figure: £1.2 billion).

M Average annual insurance claims for flood-related damage: between £0.5 billion and £1 billion by the 2080s (current figure: between £200 million and £300 million).



Focus on... Agriculture and Business

The area of UK agricultural land at risk from flooding is projected to increase by 150% between now and the 2080s. Businesses, meanwhile, may sustain more direct flood damage to buildings and assets as well as increased disruption. Supply chain disruption, for instance, may result in reduced sales and share prices. The business sub-sectors most vulnerable to flooding are wholesale and retail, finance, insurance and manufacturing.

Confidence

- H** High-quality horticultural and arable land likely to be flooded at least once every 3 years: 75,000 ha by the 2050s and 130,000 ha by the 2080s (current figure: about 30,000 ha).
- M** Average annual cost to businesses of disruption due to flooding: between £26 million and £72 million by the 2050s, rising to between £34 million and £96 million by the 2080s (current figure: £20 million).
- M** Average annual cost to business of lost staff days due to flooding: £9 million by the 2080s (current figure: £6 million).

Focus on... Infrastructure

Flooding may pose an increasing threat to critical UK infrastructure. As a result, transport networks, water supplies and sewage treatment, energy supplies, hospital and schools, for example, may face growing challenges to their ability to operate efficiently, service the economy and meet important social needs.

Confidence

- H** Length of road exposed to significant likelihood of flooding: between 13,000 km and 18,000 km by the 2050s, rising to between 14,000 km and 19,000 km by the 2080s (current figure: 12,000 km).
- M** Capacity of power stations exposed to significant likelihood of flooding: between 15 GW and 22 GW by the 2050s, rising to between 19 GW and 25 GW by the 2080s (current figure: around 10 GW).
- M** Number of hospitals exposed to significant likelihood of flooding: between 60 and 90 by the 2050s, rising to between 60 and 100 by the 2080s (current figure: around 50).
- M** Number of schools exposed to significant likelihood of flooding: between 1000 and 1700 by the 2050s, rising to between 1200 and 1800 by the 2080s (current figure: around 900).

Focus on... Erosion of Coastal Areas

Coastal erosion occurs naturally with or without climate change. Around 3000 km (17%) of the UK coast is currently eroding. Climate change may lead to a 100% to 400% increase in erosion rate, compared with the current rate. While still affecting only a very small proportion of the UK's total land area, locally this might have significant implications for communities and habitats.

Confidence

- H** Agricultural land lost due to coastal erosion: between around 6500 ha and 10,000 ha by the 2080s (0.06-0.09% of total agricultural land area in England and Wales).
- H** Loss of priority biodiversity habitat² in England due to coastal erosion: between 140 ha and 280 ha by the 2050s, rising to between 290 ha and 540 ha by the 2080s.



- High consequences (positive) ■
- Medium consequences (positive) ■
- Low consequences (positive) ■
- Low consequences (negative) ■
- Medium consequences (negative) ■
- High consequences (negative) ■
- High confidence ■
- Medium confidence ■
- Low confidence ■
- Too uncertain to assess ■

Consequences - highlights the scale of the consequences for each time slice

Confidence - highlights how confident we are that these consequences will occur

² Habitat designated under the Biodiversity Action Plan.

The Challenge of Adaptation

Flood and coastal erosion risk management legislation, policy and guidance have taken climate change into account for several years, with allowances for climate change applied when developing new flood and coastal defence schemes since the 1990s and also when considering local planning applications.

Following widespread flooding in England, Wales and Northern Ireland in 2007, an in-depth review of flood risk management was completed by Sir Michael Pitt. Lessons from this report were incorporated into legislation on flood risk management enacted in 2010 in England and Wales.

There have also been changes in the overall approach to flood risk management following recent major flood events, the intention being to improve sustainability and reduce dependence on more and bigger flood defences.

A key challenge, however, is the fact that most of the people and assets at risk from flooding are already present in the UK's floodplains. Furthermore, measures to reduce this risk (e.g. flood defence schemes) can be very

expensive. Overall, adaptation in this sector is likely to be a gradual process where defences are improved a little at a time, resilience is steadily enhanced and planning decisions take account of increasing flood risks.

An underlying challenge is the need to take account of significant uncertainty regarding future population growth as well as the number of residential and non-residential properties that will be built and their precise location. Other issues where greater clarity is needed include:

- Future flood risks in Scotland and Northern Ireland.
- Future risks posed by surface water flooding (caused by intense or prolonged rainfall) across the UK as a whole.

Where to Get Further Information

For copies of the CCRA Floods and Coastal Erosion Sector Report, the CCRA Evidence Report and Devolved Administration Reports, please visit www.defra.gov.uk/environment/climate/government/

How the CCRA was conducted

The CCRA reviewed the evidence for more than 700 potential climate impacts on the UK economy, society and environment. Over 100 of these impacts across 11 sectors were taken forward for more detailed analysis, having been selected on the basis of likelihood, potential consequences and how urgently adaptation action may be needed to address them.

A plausible range of climate change scenarios was used in the analysis. Some aspects of socio-economic change (e.g. population growth) were also taken into consideration. Adaptation policies that are planned for the future were not considered, so that the underlying level of risk could first be compared across sectors.

The results presented here are based on the UKCP09 Medium emissions scenario for the 2020s (2010-2039) and the Low, Medium and High

emissions scenarios for the 2050s (2040-2069) and the 2080s (2070-2099). A range of climate projections representing lower, central and upper estimates were considered within each emissions scenario.

Risks are categorised as low, medium or high based on their economic, social and environmental consequences.

The CCRA findings are also categorised as having low, medium or high confidence. The level of confidence is the degree to which the findings are considered valid, based on the type, amount, quality and consistency of the evidence studied.

Further information on how the CCRA results should be interpreted is presented in the CCRA Evidence Report. www.defra.gov.uk/environment/climate/government/