Planning for the risk of widespread flooding

Project Summary SC140002/S

Protecting people from flooding relies on a good understanding of the areas at risk and the possible flood events that might occur. Recent floods have raised a number of fundamental questions such as:

- Why do floods commonly described as having a likelihood of 1 in 100 in any given year seem to occur more often when viewed nationally?
- What is the chance that many different locations will be affected by severe flooding around the same time?
- What are rare but plausible (reasonable worst case) widespread flooding scenarios for national planning purposes?

This project has developed methods and guidance to address the need for realistic planning scenarios that account for the risk of widespread flooding across England and Wales, flooding from multiple sources (river, surface water and sea) and the potential impacts.

The outputs of the project have:

- highlighted the scale of the risk of flooding to England and Wales
- changed the representation of flood risks for the public facing National Risk Register (NRR) and the Cabinet Office's National Risk Assessment (NRA) and
- helped inform the National Flood Resilience Review (NFRR) and are being taken forward via that route.

They will allow central government, emergency planners and responders to review their planning assumptions, emergency response and mutual aid capabilities, to increase the England and Wales preparedness for widespread flooding.

How did we assess the risk of widespread flooding?

The chance of widespread flooding can be estimated from the likelihood of two or more events in different places occurring at the same time. The method developed in this project was based on previous Environment Agency research[1] and used historical river flow and rainfall data for England and Wales coupled with hydro-meteorological expert judgement.

We looked at how likely it is, according to the historical record, to have widespread flooding in multiple locations from multiple sources around the same time, and if this happened, what the impacts might look like. We have looked at the likelihood of risk of river and surface water flooding, both independently and combined. We also worked jointly with another Defra R&D project[2] on coastal flooding to investigate the likelihood of combined river and coastal flooding around the England and Wales.

Statistical and flood risk modelling techniques, together with the historic record of flood events, the weather and catchment conditions, were used to develop a method to model rare but plausible flood scenarios.

This method was used to assess the potential impacts of flooding in some example scenarios to inform the Government's risk assessments and enable the relevant authorities to assess how prepared we are as a country to respond to such events.

Increased attention on surface water flooding

This work highlighted the risks of widespread surface water flooding, caused when heavy rain overwhelms drainage systems. This can often make the effects of river and coastal flooding worse, but it can also be a serious risk on its own, particularly in large metropolitan areas.

Surface water flooding is more difficult to predict as it often happens very quickly during extremely heavy, local rainfall. People also tend to be less aware of the risks of surface water flooding as it can occur anywhere, often away from rivers and the coast.

Although weather forecast models are providing improved total rainfall estimates, it remains difficult to predict where rainfall will occur. This makes surface water flooding

[1] Details of the earlier work can be found in the Environment Agency project 'SC060088 Spatial Coherence- the risk of widespread flooding'.

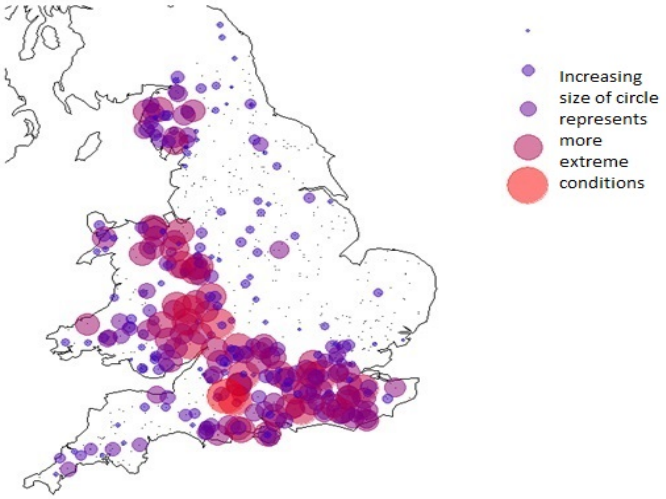
[2] Details of the coastal methodology are given in the Defra project 'FD2676 National Risk Assessment: Extreme coastal flooding scenarios. Methodology report'.

challenging to manage and to encourage people to prepare for.

Recommendations and findings

Based on this evidence and modelling work, the National Risk Register now includes a new risk on widespread surface water flooding over a major city. The existing widespread river flooding scenario has been improved and provides a stretching, yet plausible planning assumption for national emergencies. The parallel Defra project on widespread coastal flooding has highlighted the risk of coastal flooding to all coasts of England and Wales.

Figure 1 shows an illustration of a possible widespread river flood event in England and Wales.



This study has shown that serious widespread flooding is an important risk that we must prepare for nationally. It does not address the specific risks and impacts in each local area, which must still be assessed using detailed local data and modelling.

The results of this project have informed the National Risk Register and the National Flood Resilience Review. The underpinning science developed in this project will continue to be taken forward by the Environment Agency in its work to deliver the National Flood Resilience Review.

This summary relates to information from project SC140002, reported in detail in the following output(s):

Report: SC140002/R1
Title: Spatial joint probability for flood and coastal risk management and strategic assessments: Method report

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