



**Summer 2007 Floods - BHS Issues and Comments**  
**A submission to the Pitt Review [21.09.2007]**

It is clear that last summer's flooding was caused by extreme rainfall, with some areas receiving 24 hour rainfalls with return periods of 200 to 1000 years (source: CEH, "The summer 2007 floods in E & W – a hydrological appraisal"). Return periods of flooding were in many cases also very high: the Don at Doncaster and the Lud at Louth 24-25<sup>th</sup> June, both >200 years; the Avon at Evesham, Evenlode at Cassington, Lambourn at Shaw, all also > 200 years during the July flood. Many sites recorded levels greater than the March 1947 flood, e.g. at Evesham 21<sup>st</sup> July was the highest in an (incomplete) series from 1848. So the fact that there was widespread flooding should not be a total surprise, although the flooding during the summer of 2007 has no modern precedent.

The British Hydrological Society would wish to make the following observations on the events.

1. The flooding during June and July 2007 was caused by unusual meteorological conditions, with the Jet Stream being much further south than normal following a much warmer than average winter (the winter of 2006-07 was the fourth warmest since 1659). The result was a sustained series of moisture-laden low pressure systems producing unprecedented rainfall totals over a 10-week period from mid-May to late July. England and Wales as a whole received some 223% of the 1971-2000 May-July average, and many of those areas subjected to flooding received over 300% of average. The three months were the wettest since records began in 1776.
2. The severe storms of 24-25<sup>th</sup> June over Yorkshire and Lincolnshire and then 19-20<sup>th</sup> July over Gloucestershire and Oxfordshire fell on saturated catchments and resulted in very high flood runoffs more typical of winter conditions than mid-summer.
3. The events were not typical of summer convective storms, which are generally localised, since over 3,500 km<sup>2</sup> registered over 100mm, which is a very rare occurrence. However, within this broad rainfall system were more intense convective cells that led to much higher localised rainfalls and runoff.
4. Although BHS supports Interim Conclusions 1 and 3, it does not believe that there is any compelling evidence that the rainfalls during the summer of 2007 were an early indication of climate change. We believe they were merely a result of normal climate variability, although such events may be indicative of those that could result in future from climate change.
5. Climate models suggest that summers in England and Wales are likely to become warmer towards the middle and end of the century, but rainfall totals are likely to

decrease. However, warmer conditions may result in more severe, localised, convective storms, which are difficult to forecast accurately at present.

6. One result of the storms was that many urban areas suffered from pluvial, or flash flooding, where storm drains were unable to cope with the intense rainfalls. Such flash flooding may become a feature of future summer storms if climate change models are correct.
7. BHS is aware that the Environment Agency (EA) propose to work with the Met Office to develop early warning systems for flash flooding in urban areas (relates to Urgent Recommendation 2, and ICs 7 and 17) . We believe this to be ambitious, and suggest that it cannot be achieved in real-time, at least not without significant (years) of research and development (of real-time rainfall observation and flood modelling). BHS does not believe that current rainfall forecasting tools provide fine-scale short-duration rainfall of sufficient accuracy for this purpose, and advise that the Agency and Met Office are cautious about the likely success of their proposal when discussing the matter with the press or public.
8. BHS believes that the Agency is similarly cautious about its ability to forecast surface water flooding with any certainty as in its submission to the EFRA Flooding enquiry it said it was “less sanguine than Sir Michael about what is or what is not possible at this current time”.
9. We suggest that the best way of producing real-time surface water flood warnings would be to undertake a large number of modelling simulations of different rainfall intensities over different durations and to map the results for each simulation. During any future storm event, it might then be possible to look-up the anticipated flooding extent of any observed rainfall, or observed plus short-term rainfall forecast. Such an ‘off-line’ approach would be more likely to be feasible during a real-time storm, however, the exercise would be both time consuming and expensive at the national level.
10. However, modelling flash flooding effectively will require significantly better data on micro-topography, street furniture and drainage infrastructure than exists at present.
11. Similarly, the modelling results will be highly dependant upon assumptions that the drainage system is operating as designed; storm drainage systems are notoriously vulnerable to blockages, both underground, and of surface intakes.
12. It is likely that current flood forecasting models did not behave as expected during the summer floods. Hydraulic components of the forecasting system would have been calibrated on past winter storms, where channel and floodplain vegetation would have been very different to those present during June and July 2007. The EA should consider the need for re-calibration of their models and also perhaps consider seasonal variation of model parameters, or better use of models which can be updated in real-time. BHS strongly supports IC 3 of the Interim Report.
13. IC 32 suggests that the EA should consider what effects land management might have had on the summer 2007 floods. There has been considerable research recently into whether land use and farming practices might be improved to reduce flooding. Recent Defra/EA research projects (e.g. FD2114) have examined the often conflicting evidence from field and plot studies compared to catchment studies of how land use



can affect flooding. The NERC/CEH funded Pontbren studies in Wales have also examined how forestry and changed farming practices can affect flood runoff. However, further work on these topics must be carried out and BHS urges funding agencies to support such research, as some of the current findings are counter-intuitive, and in some case contradictory.

14. Defra's 'Making space for water' initiative should be strongly supported (IC 31). There are generally clear benefits to be gained from slowing the flood response to storm rainfall. If water can be stored and attenuated in drainage ditches and on floodplains rather than being conveyed rapidly to main watercourse, downstream riparians and urban settlements would benefit. However, if such an initiative is to be successful, landowners and farmers who may suffer more severe flooding must be compensated. At present no suitable regulatory or legislative framework is in place to allow such compensation payments, and Defra should be encouraged to think about how this might be achieved.
15. Managed flood washlands, such as those used to protect Lincoln from flooding should be considered as an alternative to 'hard' engineered flood defences of urban areas. BHS believes that they could offer cost-effective alternatives to other conventional engineered schemes in many situations, but again, the issue of compensation payment to those affected must be considered by Government.
16. Many people have suggested that had the EA, IDBs, Highways Authorities and riparian owners taken greater responsibility for maintaining rivers, the flooding in 2007 might have been reduced. BHS is not convinced that this would always have been the case, indeed under the 'Making space for water' initiative, some downstream flood benefits might well have accrued from the impeded headwater drainage.
17. BHS supports the use of demountable or temporary flood defences, but believes that such facilities must be stored much closer to where they are to be used to avoid the situation where demountable defences for Upton-upon-Severn were marooned on the M5 due to local surface flooding.
18. BHS is concerned about the shortage of hydrologists with flood forecasting and flood defence skills and experience within the Agency, although we are aware that the Agency is aware of this problem and is attempting to address the shortage. BHS welcomes this development.
19. BHS strongly urges Defra and other funding bodies to recognise the need for continuing support to flood risk research. For example the current work of FRMRC needs continuing support, and further work on potential climate change impacts on flooding is also needed.