

## **Integrated Approaches to Managing Floods and Droughts for a Changing Climate**

Wednesday 24th April 2013, 5.00 – 7.00pm

Attlee Suite, Portcullis House

### **Seminar Summary**

Water is a shared natural resource society relies on and its management needs to take into account a wide variety of conflicting interests. It is critical to food, energy and material production (the ‘food-water-energy nexus’) as well as the functioning of natural resource systems. Changing flood and drought risks could be managed by large scale investment in infrastructure or through adapting landscapes and existing infrastructure through measures to restore freshwater systems, including:

- Restoration and recreation of landscape features such as ponds, ditches, channels, wetlands or riverside woodlands to slow surface water flows to reduce maximum flood heights or delay the arrival of flood peaks, as well as increasing infiltration into groundwater and the resilience of river flows during low rainfall periods (‘Natural Water Retention Measures’).
- Minimising impact of built infrastructure on natural hydrological and ecological processes, through ‘water sensitive urban design’. This approach, widely adopted in Australia, incorporates a range of technologies that promote water efficiency, manage the effects of urban surface water flows on watercourses and maintains groundwater levels and flows.
- An ‘ecosystems approach’ to managing river catchments, based around the connections between natural processes, the services water systems provide to humans and the participation of stakeholders, which integrates competing social, economic and ecological needs and values (as demonstrated by Defra’s catchment based approach to water management pilots).

POST held this seminar to allow parliamentarians to discuss with experts the opportunities and challenges arising from more integrated approaches to managing water resources. The seminar was chaired by **Lord Whitty of Camberwell** and attendees heard presentations from five speakers:

- **Professor Ed Maltby** - Emeritus Professor of Wetland Science, Water and Ecosystem Management, University of Liverpool and Visiting Chair of Research Innovation at Louisiana State University
- **Richard Benyon MP** - Defra Parliamentary Under-Secretary for Natural Environment and Fisheries
- **Professor Jim Hall** - Director of the Environmental Change Institute, University of Oxford and Member of the Adaptation Sub-Committee of the UK independent Committee on Climate Change
- **Professor Alan Jenkins** - Deputy Director of the Centre for Ecology & Hydrology and Science Director for the Water Research Programme
- **Ian Barker** - Head of Land and Water at the Environment Agency

Slides and audio from each presentation are available on the POST website at

<http://www.parliament.uk/mps-lords-and-offices/offices/bicameral/post/post-events/integrated-approaches-to-managing-floods-and-droughts-for-a-changing-climate/>. Short summaries of each talk are given below.

### **Professor Ed Maltby, Emeritus Professor of Wetland Science, University of Liverpool**

Professor Maltby stated the effects of more frequent extreme weather events and greater variability has led to a greater emphasis on vulnerabilities arising from land management measures that reduce

resilience to floods and droughts. Changes to land management and the use of natural resources can be controversial, but there is now widespread recognition of the value of natural capital and how it underpins economic sustainability. The UK has taken a lead in this area with the National Ecosystem Assessment, which recognised that there has been widespread loss of wetland habitat, including nearly half of the floodplains of rivers, resulting in an accelerated run-off from land, through the catchment to the sea, with the functional connectivity across the whole landscape of catchments simplified. The increase in freshwater flows in response to the high rainfall levels in 2012 was sufficient to drive cod out of inshore waters affecting the fishing industry in the South-West.

There has been a policy shift to managing flood risks at the catchment scale, which requires knowing what works where. For example, the upstream floodplain for the River Cherwell is critical for managing flood risk in Oxford. The ecosystem approach requires societal choice about what, how and where ecosystem service benefits are exploited, which needs to be addressed at the appropriate scale. At catchment scales, 3<sup>rd</sup> party non-governmental actors, such as River Trusts, can be effective in negotiating the appropriate balance between productive ecosystem services, such as food provision and other ecosystem service benefits, such as flood prevention and drought mitigation. For example, in the catchment of the River Tamar, farmers have been paid £2,300 by the West Country Rivers Trust to retain flood water on soil, keeping it saturated all winter. However, the evidence base for what works where remains limited. The South West Water 'Upstream Thinking' initiative consulted consumers on what they were willing to pay to enhance ecosystem service delivery (£1.80) and Ofwat agreed to allow expenditure of £0.65 per customer, which has been used for the restoration of peatland and measures to reduce the rate of surface run-off from land. However, creating a multifunctional landscape that delivers appropriate levels of all the required ecosystem service benefits will need appropriate level funding from a range of flexible sources, including CAP.

**Richard Benyon MP, Defra Parliamentary Under-Secretary for Natural Environment and Fisheries**

2012 was the wettest year on record with 131% of the average rainfall, often in intense rainfall events, leading to the flooding of over 7,000 homes. The Government continues to improve flood defences with a further 64,000 homes protected since 2010 and up to 165,000 by 2015, but it will not be practical to build flood defences to address all possible risks. To mitigate risks we will need to use the natural environment better, with the UK National Ecosystem Assessment providing the evidence base for how, the Natural Environment White Paper the rationale for doing so and the forthcoming National Adaptation Programme setting out how communities can be 'climate ready'.

The Thames Estuary 2100 project (TE2100) pioneered a flexible approach to river and coastal flood risk management planning out to the end of the century. Together with the Thames Estuary Partnership they were appointed to co-host the Tidal Thames Catchment Project. Typical measures include reshaping riverside environments to provide more flood storage capacity through softening the boundaries where space allows, including small and local rivers. Slowing the rate of flow of surface water is critical, with projects, such as the one in Pickering showing how land management measures can reduce flood risk. This has involved the Forestry Commission, Natural England and the Environment Agency working together to show the effectiveness of strategically placed bunds, woody debris dams and wood planting. In November 2012, Pickering came close to flooding and local people believe the peak flows were reduced by the measures, but evidence remains anecdotal at this stage. Community resilience fund projects are also underway in the South West to help them

develop their own approaches for mitigating the risks of rapid response catchments based on natural processes, but there will still be a need to build hard defences in the future. However, more effort is needed to understand fully how natural systems can be optimised to protect communities.

**Professor Jim Hall, Member of the Adaptation Sub-Committee of the UK independent Committee on Climate Change**

There are significant uncertainties about future levels of flood risk, but a systems approach to flood risk would reduce flooding vulnerabilities in general. Generic measures such as sustainable urban drainage systems to reduce the rate of run-off from impermeable surfaces can reduce risks and there is clear cost benefit for green infrastructure measures that store floodwaters. However, the overall flood risk is drifting upwards with increased building on flood plains, with 50% of development on floodplains in high risk areas. The Environment Agency is a statutory consultee on developments on floodplains and can object to them or insist on measures such as flood proof developments. However, only about 50% of local development plans take account of flooding and whilst some Local Authorities are taking account of Strategic Flood Risk Assessments in plans, many aren't. Expected cost of property damage caused by annual river flooding is already £690 million, £310 million for coastal flooding, £320 million for surface water flooding and 16 million for sewer flooding, with significant rises expected in these costs by 2080.

There will also be an increase in risks of water shortages due to over-abstraction and increasing population pressure, although there are a lot of uncertainties in projected deficits. Changes in precipitation with climate change are uncertain, but rates of evapotranspiration from surface water bodies will increase. There is significant scope for increasing resilience by reducing water demand through water efficiency measures, which could get demand down to 115 l/p/d (from the present 150 l/p/d). However, looking at the deficit reduction pathways out to 2080 there is a lot of uncertainty as to whether the supply demand gap can be closed using current suggested approaches. In June 2013, the Adaptation Sub-committee will publish their fourth report, focusing on the natural environment including catchments and coasts. In November 2013, Defra will publish the first National Adaptation Programme, and an assessment of progress against this will be published by the Adaptation Sub-committee in 2015.

**Professor Alan Jenkins, Deputy Director of the Centre for Ecology & Hydrology**

The summer of 2012 was a unique event for hydrologists, the first recorded time groundwater aquifers have recharged in summer months as a result of very high rainfall. Following the floods in 2007, the Pitt Review recommended the creation of a joint flood forecasting centre, between the Environment Agency and Met Office. The Centre for Ecology and Hydrology has provided the flooding model for the centre, the Grid to Grid (G2G) Runoff Production Model. This model provides probabilistic risk predictions of flooding, which the Environment Agency translates into flood risk warnings. The move away from extreme rainfall alerts to a more targeted response is an improvement but there is still a long way to go, particularly in terms of better understanding risks and vulnerabilities. The Natural Hazard Partnerships is working to improve predictions of what national infrastructure will be at risk during extreme events.

The model can also be used to assess drought severity and to produce a hydrological outlook one month ahead to predict drier or wetter conditions. In general, there is a lot of data about river flows but much less data about soil moisture, but NERC is currently seeking to address this through its new

cosmic ray soil moisture observing system –COSMOS. However, previous assumptions about the frequency of extreme weather events no longer apply and statistics of previous weather events are no longer a reliable guide to the future. Annual temperatures are changing, but surface river flows are not, but the reasons for this are not well understood and there are lots of uncertainties about future water security projections. This doesn't just apply to the UK but globally, affecting issues such as food security.

### **Ian Barker, Head of Land and Water at the Environment Agency**

The Environment Agency is at the sharp end of delivery, managing the risks of flooding and maintaining supplies for both human wellbeing and economic growth, whilst improving the environment. Given that the past is no longer an effective guide to the future there is a need to understand how it will be different and when it will be different. The case for change reports, produced to support the Water White Paper, set out the likely combined changes in supply and demand for water, including demographic change. The systems for abstraction licences is fifty years old and no longer fit for purpose and a new abstraction licensing system will be consulted on later this year. The reformed system will need to reconcile the needs of society and the environment by setting an appropriate baseline for abstraction, but there will be flexibility around this to help abstractors, such as farmers, to use what is available more efficiently. Overall, both demand and resources will need to be better managed.

For the first time per capita water consumption has been static and is starting to fall, with greater public awareness of the need for water efficiency and the uptake of water efficient appliances. Lower levels of water use would reduce demands on water infrastructure, such as the sewerage system, but householders also need to reduce surface run-off through measures such as water butts. The leakage rates from the water supply network has remained static for some years and the projected 10% reduction by water companies out to 2035 is unlikely to be sustainable and will have to be at least 20%. The system will need to be more resilient and adaptive to shocks start taking account of unprecedented weather patterns, including the possibility of more than two sequential dry winters. This would include a range of adaptive responses, for example, back-ups and contingencies such as desalination plants, water transfers and effluent reuse. In 2012, 1 in 4 days was spent in drought, 1 in 5 days were spent in flood and it is not possible to predict the duration of such extreme events. However, an integrated approach to catchment management would deliver multiple benefits as well as greater scope for an adaptive response to such conditions.

### **Discussion**

A number of issues were raised by the audience and discussed by the panel of speakers:

- The appropriate balance in research and innovation between the public and private sector, as the private sector tends to focus on technologies rather than systems innovation, with the exception of South West Water, Wessex Water and United Utilities. However, it was felt the need to control costs to the consumer would drive a greater emphasis on working with natural systems, such as payment for ecosystem services and land management measures.
- The issue of the impact of flooding on natural systems was discussed and whether more water arriving more quickly downstream has an effect on marine fish populations breeding in estuaries.
- The evidence base supporting the definition of ecological flows.

- The effect of repeated drought and flooding on carbon storage by peat systems and whether there is a tipping point beyond which they begin to release carbon. It was noted that many peat systems in upland areas are declining, but it is difficult to distinguish how much of this is due to human impacts and how much is due to natural factors. Nonetheless, retaining them is critical to slowing peak flows and reducing flood risks.
- Whether catchment management schemes will be encouraged by the move from the CAPEX/OPEX approach by OFWAT to a TOTEX approach and approving outcomes rather than individual projects.
- The legislation for a new abstraction system will not be introduced until the next parliament as there is a need to understand what the reformed abstraction system should look like and how it will operate before legislating. Any new approach needs to be robust and evidence-based.