DEFRA FLOOD RISK MANAGEMENT AND MODELLING COMPETITION

Why are we holding a competition on this topic?

Recurrent flooding in the UK over recent years has catalysed a range of interesting academic work spanning catchment-scale hydrology, channel hydraulics (including geomorphology impacts), land use impacts (including new models based on EO data), and the relative potential of both hard engineered and natural flood defences to cost-effectively reduce risk. Work for the Government's National Flood Resilience Review has highlighted not only this progress in the underlying science and modelling, but a variety of promising new thinking on approaches to risk mitigation, ranging from property-level resilience measures through to new economic and engagement frameworks.

Defra is keen to see this thinking crystallised into practical policy proposals, which build on the scientific and economic evidence base but focus on demonstrating a specific local application. In this way, we hope to achieve an intelligent consolidation of the evidence base, a deeper understanding of the practical applicability of the approaches which have been proposed, and a solid starting point for future work on catchment-based multi-objective flood risk management.

Why is the competition focused on the Eden?

Although we are ultimately interested in identifying tools and approaches that can be applied to multiple catchments facing different kinds of challenges, the Eden offers a particularly good case study for a variety of reasons :

1 It has experienced a material amount of flood-related damage over recent years and is therefore a key focus of the Government's current floods analysis. The Cumbria Floods Partnership has already brought together a number of local bodies to focus on the question of flood risk management, and their initial report later this month will provide a solid starting point for further discussions.

2 The Eden is also likely to feature strongly in further work on integrated catchment management. This will build on ongoing Demonstration Test Catchment work on the Eden and a variety of other broader local natural capital related initiatives.

3 The Eden has already been the focus of a number of previous academic studies, which provide a broad evidence base and suggestions of issues to address. In combination with a wide range of new data, from the Defra Open Data Programme (which will conclude the initial release of over 8,000 datasets by the end of this month) and from sources such as new Earth Observation Systems (EOS), there should be good scope for new model calibrations and evidence-based analysis.

4 The Eden is a relatively large catchment which encapsulates many of the same constituent challenges faced elsewhere in the country.

How will entries be assessed, and who should enter?

The principal aim of the competition is to generate evidence-based practical policy proposals on flood risk management in the focus catchment. As such, we can imagine a wide variety of potential approaches, and for this reason we've decided to award two series of prizes, one for the overall practicality and quality of the proposals and one for innovation in a particular area. In this way, we hope that those entrants with strong data, analytic or modelling capabilities will be encouraged to use the results of new tools or recalibrations of existing approaches as part of their entries, while other entrants will be able to build on previously published science but bring new thinking to bear on practical application, economic frameworks, local community considerations and the like. The best entries may incorporate both these aspects, and we would like to encourage the formation of multi-disciplinary teams where appropriate – something we will seek to facilitate through the registered entrant group and launch event. However, we would encourage anyone who has a substantive, practical and evidence-based proposition to submit an entry – even those entries which don't ultimately win a prize may highlight some interesting approaches or evidence neglected by others, and we expect all entries to inform future work in some way, not just the leading submissions.

We would consequently hope for participation from academics in the fields of hydrology, channel hydraulics, geomorphology, land and water management, civil engineering, catchment management, environmental economics, and risk management; from consultancy companies specialising in flood risk assessment and mitigation; from technology companies with relevant modelling frameworks or new data sources (such as EO data); from insurance companies and flood risk underwriting specialists; from water companies; from forestry experts; and from a wide range of NGOs (wildlife and rivers trusts, wildlife charities) with an interest in multi-objective catchment management.

Potential areas of focus

To date projects have been commissioned have had a natural flood management (NFM) driver or provided NFM benefit as an added benefit. There are an estimated 30 communities at risk on the Eden. Many of these will sit on the smaller sub-catchment scale.

We can imagine a variety of areas that may be addressed by a successful entry, and the winners are likely to be those which provide the best possible evidence context for a spatially focused, provisionally costed, and potentially implementable scheme. Entrants may wish to briefly review the salient features of the catchment, the concentrations of value at risk, the scope of existing defences, and the principal residual risks. Entries may draw on previously published material (suitably referenced) including Environment Agency datasets and maps, but would be expected to incorporate some form of new thinking analysis or modelling. The strongest entries may include some of the following aspects:

(i) Identify the range of options that can be applied on the catchment.

(ii) Start to look at how we might go about scaling up NFM for larger settlements like Appleby and Carlisle with the larger catchments above them (beyond the 200km2 that seems to be the accepted threshold at present for effectiveness).

(iii) Changing / modifying the combination of options on a catchment to look at the effect on flows etc.

(iv) An approach that identifies how to work with Environment Agency modelling for traditional flood defences.

(v) Approaches that can adapt to future technology as best as possible.

(vi) Quantitative analysis of the distribution of ***flow and depth estimates*** at various points throughout the catchment system, including indications of sensitivity to precipitation intensity set within the context of historic experience and climate sensitivities.

(vii) A quantitative and spatially explicit assessment of the consequent ***risk of flooding from channel overtopping*** throughout the catchment system, including assessment of the likely spread and depth of any consequent fluvial flooding.

(viii) A similar assessment of the risks of ***surface water, groundwater and / or coastal / tidal flooding***, and an assessment of the cumulative consequences.

(ix) Analysis of the impact of ***sediment transfer and channel maintenance*** strategies on outcomes.

(x) Quantitative observations on the principal ***exposed assets*** within the catchment, with an assessment of their apparent vulnerability or resilience to flood events.

(xi) Quantitative and spatially explicit recommendations on ***potential NFM approaches*** which could be employed within the catchment to mitigate the risk of flooding in the most cost-effective way (balancing likely capital costs against expected damage reduction). These may include tree planting, associated woodland strategies, and permanent or contingent land use change including the creation of wetlands.

(xii) Analysis of ***semi-engineered approaches*** such as contingent land sacrifice schemes.

(xiii) Elements of formal ***cost-benefit analysis*** for the principal proposed schemes.

(xiv) Spatially explicit and quantitative observations on ***multi-objective benefits*** associated with proposed schemes, such as economic impacts from land-use change, habitat and biodiversity benefits, water quality and erosion control benefits, recreational and tourism impacts.

(xv) Observations on the principal ***data gaps*** affecting the analysis, with thoughts on their likely materiality and options for cost-effective improvements.

(xvi) Brief observations on the ***pros and cons of any modelling approach*** used, set within the context of other available approaches, including a discussion of the applicability to catchments with differing characteristics (geology, land use, drought, urbanisation).

(xvii) New thinking on ***local community engagement*** approaches, including measures relating to property level resilience, warning systems and flood response.

(xviii) ***Innovative financing*** approaches, including potential payments to and from householders, insurers, landowners, community groups and multi-objective beneficiaries, or models to leverage public sector funding.

(xix) A short discussion of ***potential extension work*** which might help to crystallise initial observations and modelling into more concrete and costed proposals.

(xx) Some observations on the potential ***transferability*** of the approach demonstrated on the Eden to other catchments, and comments on any key data or evidence gaps which may be present in other areas.

Elaborating on the competition question

The central competition question is formulated as follows:

> *If you were responsible for managing the Eden catchment in Cumbria, what flood risk management approaches would you recommend, and why?*

The context can be assumed to be the allocation of additional flood defence funding to the catchment, which needs to be employed in the most cost-effective way. Benefits should focus on expected flood damage avoided for various levels of spending, taking into account reliability, but may also reflect broader social, environmental and economic impacts, especially to the extent that these can be monetised. Practical constraints should be considered, and the likely perspective of the local community on different approaches should be taken into account. Any impact on visitors to the area may also be considered.

Format

Entries would take the form of a short briefing paper (maximum 5,000 words, plus references). The briefing paper should ideally be presented as an A4 pdf document in Arial 12 or similarly sized typeface, and may incorporate maps, graphs, charts or tables as required. References should be presented as endnotes, beginning on a separate page at the end of the document, and should ideally incorporate hyperlinks through to material available online. The cover page should include a short abstract (maximum 200 words) highlighting the principal areas of focus and any innovative approaches incorporated. IPR will be retained by the entrant with use and access of the winning and runner ups and will be made available to the public.

Competition timeline

27 Jun 2016	Cumbria Floods Partnership report, release of additional background on competition prizes, sponsors, judges and potential target areas
20 Jul 2016	Competition launch event (10.00-14.00) incorporating ministerial address, brief presentations on CFP work, prior research and data, discussion groups, lunch, technology demonstrations, networking
29 Jul 2016	Registration for competition entry closes
30 Sep 2016	Competition closes
3-7 Oct 2016	Defra first stage review of entries
10-28 Oct 2016	Main judging process, allocation of prizes
Nov 2016	Awards ceremony (precise date TBC)