A whole catchment approach to improve flood resilience in the Eden

Jeremy Benn Associates + Lancaster Environment Centre

Defra set the following challenge for the Cumbrian Flood Competition:

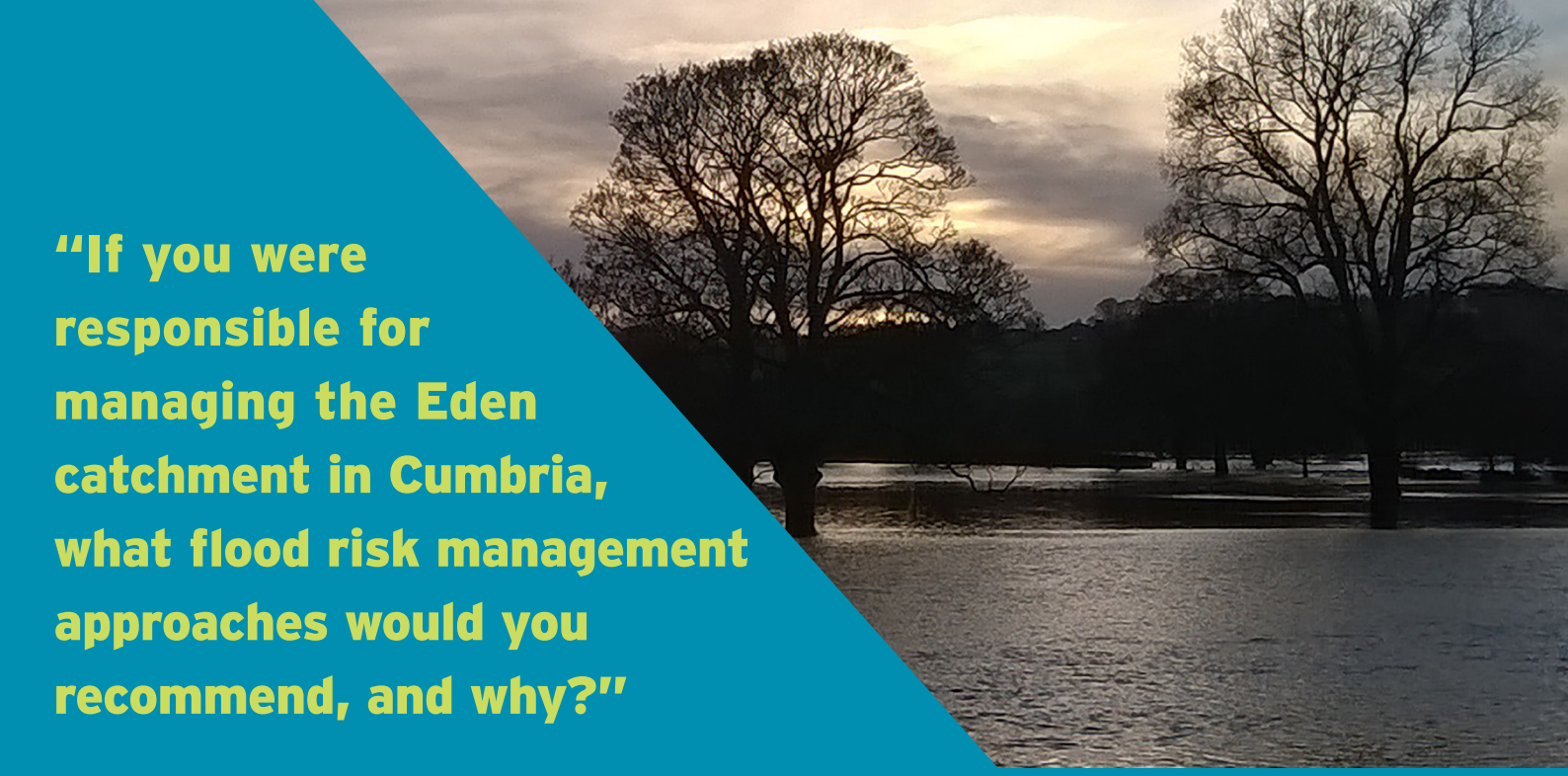
"If you were responsible for managing the Eden catchment in Cumbria, what flood risk management approaches would you recommend, and why?"

Our entry mixes advances in computer modelling and data analysis with local engagement, and our aim has been to help develop realistic flood risk management proposals that can combine working with natural processes with other, more established ways of building resilience against flooding.

The new methods developed by JBA and LEC will help to deliver on a recommendation by MPs that measures like this need to be a key part of protecting against the risk of flooding , and fit in with the Government's recent National Flood Resilience Review , which highlighting the scope for further developments in flood modelling.

The innovations demonstrated build on more than 10 years of research, development and testing of JBA's flood models, which simulate the flow of water through the landscape, and research partnerships with Lancaster University to assess the statistical likelihood of extreme flood scenarios and predict how flood water could be effectively held back within streams and rivers.

Our team of inter-disciplinary experts and practitioners was led by JBA, a framework consultant for the EA's Water and Environmental Management services, and LEC, one of the country's leading environmental research and teaching centres, have assessed flood risk in the Eden using recent advances in whole-catchment modelling and recommended a range of measures to improve flood resilience.



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

These measures focus on working with natural processes through distributed "natural" flood risk management (NFRM) in the headwaters, but also include large scale flood storage in the lower catchment and new, innovative non-structural measures emerging from national projects we designed. These include improved interpretations of flood warnings, interactive maps showing property-level impacts based on detailed models, and real-time event footprints.

We have put risk management measures to the test using sets of innovative data sets, both included in the recent National Flood Resilience Review (NFRR), namely: (1) "worst credible case" extreme rainfall developed by the Met Office (MO), and (2) probabilistic spatial flood event scenarios developed using recent advances in spatial joint probability (SJP) modelling (developed by Lancaster and JBA), as previously applied in the insurance sector and to underpin the latest National Risk Assessment inland flood scenarios. We have applied these data sets to demonstrate a step-change in the approach for testing resilience strategies rigorously by modelling catchment responses to events, with and without resilience measures, under a much wider range of realistic extreme event scenarios than would conventionally be applied.

Our modelling approach here builds on ongoing work in the Eden, Derwent and Kent catchment for the Rivers Trust (RT), and uses a state of the art, 93,000,000-cell fully distributed two-dimensional (2d) flood flow model driven directly by rainfall as recommended in the NFRR. We argue that for catchments at this scale or larger, and with such distributed measures, we should test flood resilience measures using a wide range of plausible extreme events (plus historical events) rather than relying on only one or a handful of assumed scenarios, as with current practice.