

25 June 2020 12:30 – 13:30 Dr Jessica Fox, Senior Flood Risk Officer, Hull City Council

*Working with natural processes in lowland environments – modelling, mapping, and evaluating*

Answers to questions submitted before webinar

|   | Is there anything in particular you hope this webinar session will cover?  | Do you have a question on this webinar topic you would like answered during the session? |
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| 1 | <p>I am interested in comparisons between this project and the lowland catchments I cover as a Catchment Co-ordinator</p> <p><b>JF – have you looked at the Yorkshire Dales Rivers Trust Lowland NFM measures – a practical guide for farmers? – it’s a useful resource</b><br/> <a href="http://www.yorkshiredalesriverstrust.com/natural-flood-management/downloads/">http://www.yorkshiredalesriverstrust.com/natural-flood-management/downloads/</a></p>   |  |
| 2 | <p>aggregation /cumulative flood reduction (and ecological) benefits of measures at certain points in the landscape from</p> <p><b>JF – hydrological benefits (peak flow and time to peak) were measured within the upper sub-catchments before and after NFM measures AND between 2 points at different locations within the main River Hull catchment (see Synthesis report, Appendix D and Appendix I, which can be downloaded from <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> in the ‘Resources’ section.</b></p> |  |
| 3 | <p>I would like to see good, realistic, positive linkages with modern, productive lowland farming</p> <p><b>JF – the results of this study suggest contour ploughing could provide a flood risk benefit in terms of creating barriers to the surface runoff pathways by increasing soil interception and infiltration. Field leaky dams showed to provide the largest hydrological benefit in terms of reducing peak flows. This is again by intercepting surface runoff. Both of these suggested NFM measures are very</b></p>  |  |

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|   | <b>likely to provide land and soil management benefits as well as increasing the carbon sequestration potential.</b>   |  |
| 4 | Map creation and where to source detailed tributary watercourse maps for communication of project works to locals.<br><b>JF – Project partners and the Hull &amp; East Yorkshire catchment partnership will share the findings of the study, including the opportunity maps, with land farmers and managers going forward. To view and download the maps and methods of making the maps see Synthesis report, page 27 and Appendix F, which can be downloaded from <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> in the ‘Resources’ section.</b> |  |
| 5 | Interested to see where things are   | How have they tied in the works in relation to cost/benefit etc or have projects been funded without flood schemes?<br><b>JF – this project was a study to assess the potential hydrological benefits of implementing NFM rather than installing the measures. We initially planned to carry out a cost/ benefit analysis in line with current EA FDGiA guidelines but with the benefitting area being mainly agricultural land only 2 properties were identified so instead we focused on developing the NFM evaluation matrix.</b>   |
| 6 | Data sources<br><b>JF – we tried to use as many published studies as possible, especially when developing the NFM evaluation matrix. For a list of data sources used please see synthesis report. <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’.</b>   | Can you determine the minimum number of interventions needed to have an impact?<br><b>JF – we measured the hydrological benefits of 7 measures individually and then collectively to see how different measures performed – field leaky dams showed the greatest reduction to peak flow and floodplain reconnection and wet woodland showed the greatest time delay to the peak (see opportunity maps to see how many of each intervention were modelled, <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’.</b> |
| 7 | I would like to learn best practices from other countries  | May be   |
| 8 | Advice on how to draw in local community groups for future maintenance<br><b>JF – as this was a study rather than implementing the measures on the group this was not relevant for this study at this time.</b>  |  |

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| 9  | <p>Digital Nat cap?/quality not quantity ?/ elms/ connectivity to improve depauperated areas</p> <p><b>JF – this study highlights the benefit of implementing several of the same NFM measures AND the benefit of implementing multiple NFM measures at many locations across a catchment. See synthesis report, Appendix B for technical report on results of modelling, <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’.</b></p>   |  |
| 10 | <p>How we can really quantify the difference the interventions make downstream when we have no pre installation data</p> <p><b>JF – we used Digital Elevation Models (DEMs) in a landscape evolution model (CAESAR-lisflood) to run different rainfall events over the upper sub-catchments before and after implementing modelled NFM measures so we could quantify the potential benefits. Currently there is no monitoring in place to provide baseline data.</b></p>   |  |
| 11 | <p>Beavers</p> <p><b>JF – not looked at in this study</b></p>  |  |
| 12 | <p>Implications - positive and negative - for the historic environment, and some insights into what Historic England might be able to offer to the process.</p> <p><b>JF – historic sites were not looked at in detail for the study however there are ongoing projects in the Hull &amp; East Riding area that DO focus on historic environment, for example Holderness Drain Flood Alleviation Scheme - <a href="https://www.hullccnews.co.uk/14/05/2020/work-on-multi-million-pound-east-hull-pumping-station-to-begin/">https://www.hullccnews.co.uk/14/05/2020/work-on-multi-million-pound-east-hull-pumping-station-to-begin/</a> , and Chalkshire - <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a></b></p> |  |
| 13 | <p>Ways of working with landowners and communities</p> <p><b>JF – as this was a study there was a limited amount of engagement with landowners and communities but now that the study has been completed the results will be shared with both groups via members of the East Riding Catchment Partnership.</b></p>   |  |
| 14 | <p>The evaluation method used to calculate cost benefit and ecosystems services benefits of implementing NFM measures</p> <p><b>JF – see comment in row 5 regarding cost benefit analysis. This study used the ecosystem benefit wheels (EA WWnP) to quantify ecosystem service benefits</b></p>   |  |

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|    | <p>rather than calculate for each measure individually. See Synthesis report Page 40 and Appendix E to see how we implemented these into the NFM evaluation matrix tool. <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to 'Resources'.</p>   |  |
| 15 | <p>What conclusions and recommendations has the project reached in relation to the effectiveness of NFM on lowland catchments?</p> <p><b>JF – this study identified 7 NFM measures that produced hydrological benefits within the lowland upper sub-catchment of the River Hull. It is likely that the 7 measures identified here will also be applicable to other lowland areas, especially field/ in-channel leaky dams as more water can be stored behind a dam when there is a smaller gradient (see Synthesis report, Appendix E, page E4 for a technical explanation, <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to 'Resources').</b></p> |  |
| 16 | <p>Costs and benefits (including wider benefits). modelling scope (if different to usual flood risk modelling)</p> <p><b>JF – see comment in row 5 regarding cost benefit analysis. See Synthesis report and appendices to view technical reports of the modelling approach used.</b></p>   | <p>How is land and soil management being used to reduce run-off?</p> <p><b>JF – This study models the hydrological benefits of contour ploughing and makes reference to how contour ploughing could increase soil productivity, water infiltration and storage capacity.</b></p>   |
| 17 | empirical results   |  |
| 18 | Keeping up to date with NFM in lowlands. I have lowlands catchments so this will be interesting   |  |
| 19 | <p>Grants &amp; sources of advice available in England</p> <p><b>JF – this study was funded by Environment Agency Flood Defence Grant in Aid. This study identified potential future sources of funding for implementing NFM measures, see Synthesis report, page 54, <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to 'Resources').</b></p>   | <p>What planning permission or EA consents are required in England, please?</p> <p><b>JF – not included in this study but I recommend you look at the Yorkshire Dales Rivers Trust Lowland NFM measures – a practical guide for farmers which provides a summary of permission required when considering NFM works <a href="http://www.yorkshiredalesriverstrust.com/natural-flood-management/downloads/">http://www.yorkshiredalesriverstrust.com/natural-flood-management/downloads/</a></b></p> |
| 20 | If there are any recommended interventions and if we have an evidence base to show differing effects around the catchment.  |  |
| 21 | Assessment of Leaky dams  |  |

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| 22 | <p>How have people persuaded landowners to implement NFM in the lowlands?<br/> <b>JF – this project was a study to explore the potential benefits of NFM in lowlands but we did have contact with one agri-business who has implemented NFM. See Synthesis report, appendix B for detailed technical report on the site and there’s also a useful video about the project:</b><br/> <a href="https://www.youtube.com/watch?v=YJpQPXQwxWw">https://www.youtube.com/watch?v=YJpQPXQwxWw</a></p> |  |
| 23 | <p>How effective are NFM features at reducing flood risk?<br/> <b>JF – see synthesis report for modelled hydrological benefits of implementing NFM on the flood peak and time to peak,</b><br/> <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’).</p>   |  |
| 24 | <p>How the community is involved in opportunities and decisions?<br/> <b>JF – not relevant in this study.</b></p>   | <p>How is NFM in lowland catchments being programmed into future delivery e.g. FCRM, growth and infrastructure, DWWMPs, FRMPs, RBMPs<br/> <b>JF – this study has identified that only 2 properties could benefit from NFM so it is unlikely that FDGiA will be sought after to fund implementation of NFM in this area. Instead, a wider and more holistic approach will be taken with the Hull &amp; East Riding Catchment Partnership to identify alternative sources of funding.</b></p> <p><b>NFM/ WwNP is being embedded in Hull’s local flood risk management strategy to promote the consideration and use of natural based solutions to the risks associated with flooding and climate change.</b></p> <p><b>A section of potential funding opportunities is provided in the project synthesis report (page 54, section 5.2), which can be downloaded from: <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’.</b></p> |
| 25 | <p>Evidencing the effectiveness of NFM interventions in lowland environments<br/> <b>JF – see comment in row 23.</b></p>  |  |
| 26 | <p>Increase my knowledge</p>  | <p>No</p>  |

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| 27 | Hydraulics in NFM   |  |
| 28 | <p>Assessment of potential sites.<br/> <b>JF – see Synthesis report, page 19 for a detailed explanation of site selection, <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’.</b></p> | <p>How can we avoid negative consequences for property in the flood plain when choosing NFM sites and designing NFM measures?<br/> <b>JF – local knowledge will be key to identifying positive as well as negative impacts of NFM. Model runs for different scales of events could help identify this but in catchments with multiple influences, such as groundwater and surface water, integrated models would need to be used but these are often very expensive and lengthy.</b></p> |
| 29 | <p>NFM opportunity mapping<br/> <b>JF – see Synthesis report, Appendix F to view opportunity maps, <a href="https://catchmentbasedapproach.org/get-involved/hull-east-riding/">https://catchmentbasedapproach.org/get-involved/hull-east-riding/</a> Scroll down the page to ‘Resources’.</b></p>                         |  |
| 30 |   | <p>How does NFM work in hand with PFR (Partnerships for Renewables?)?<br/> <b>JF – This study used Ove Arup as the consultants and Energy and Environment Institute at University of Hull as sub-consultants, not PFR.</b></p>   |
| 31 | leaky dams  |  |
| 32 |   | No - just interested in the approach taken   |